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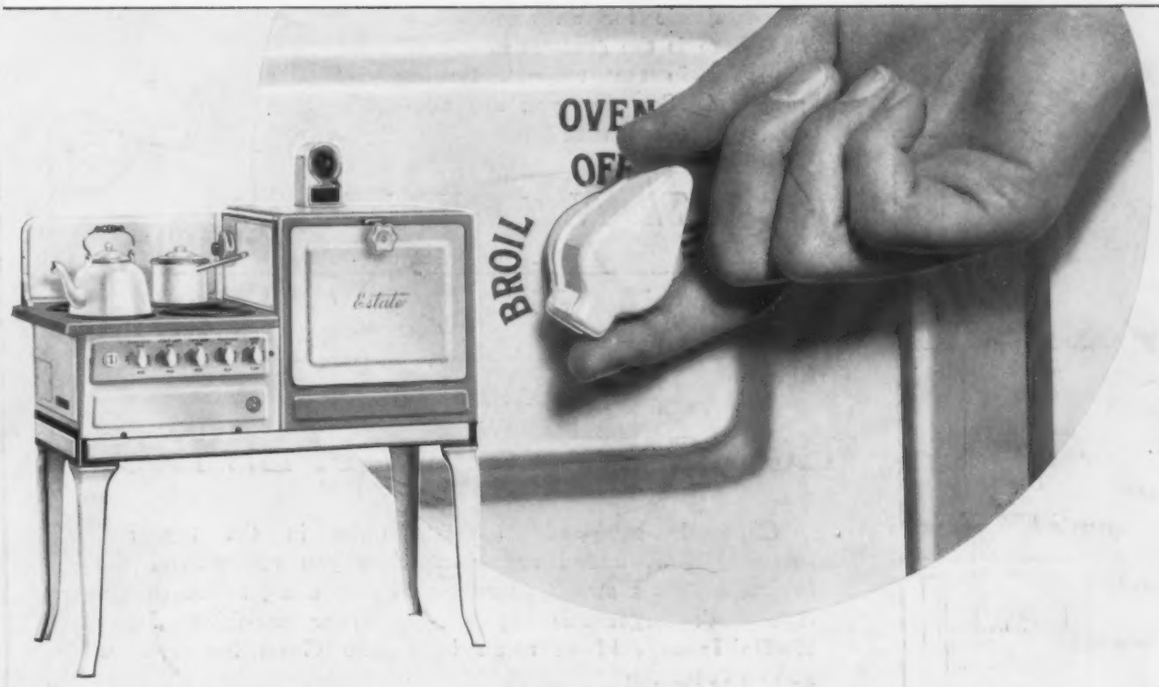

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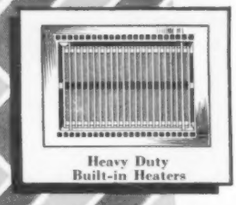
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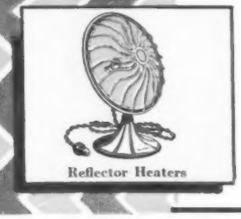
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Those delightful sentiments which pour happiness into many lives at this season, also—happily for far-sighted electric appliance dealers—pour profits into their business.

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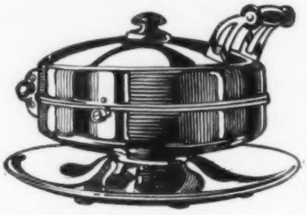

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COMBINATION

HOT CAKE and WAFFLE IRON

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Philadelphia — Executive Office and Factory 590 Folsom St. San Francisco — Kansas City

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C. T. HUTCHINSON, *Editorial Director* — A McGRAW-HILL PUBLICATION — G. C. TENNEY, *Managing Editor*

Volume 62 — San Francisco, May 1, 1929 — Number 5

Enter a New Group of Municipal Ownership Advocates

HERETOFORE there have been three classes of advocates of municipal ownership. The first is that group of well-meaning but misguided students of economics who sincerely believe in the soundness of the theory of government ownership and operation. The second is that large group of politicians who would make capital for themselves and jobs for their supporters by putting the government into business. Finally there is that class of newspapers which would promote circulation and popular approval by attacking successful business.

To these there has been added a new class, the hard-headed, close-figuring, dollars-and-cents business man, who has something for sale and seeks a market in which to sell it with, naturally, a profit to himself and his associates. Recent events in California are indicative of the attitude and methods employed by this latest advocate of municipal ownership and operation of utilities.

In Santa Cruz a private company backed by business interests attempted to foist a municipal ownership project upon the citizens of that city. Owners of water rights on a nearby stream, they offered to erect a power plant, transmission lines and distribution system, lease the property to the city for a period of forty years, deliver a specified amount of power for the annual lease figure and sell the remainder of the plant output to the city at "cost." Probably no municipal-ownership fight in California was waged with greater vigor or more bitterness. The project was defeated on April 16 by 724 votes out of a total poll of 4,626 votes, the largest ever recorded in a Santa Cruz municipal election.

Added to this there has been introduced into the California legislature a series of bills to make such undertakings as the Santa Cruz project more feasible under the law and assuredly profitable to the promoters. Condemnation of facilities of existing utilities would be expedited by permitting outside agencies to deposit funds with the Department of Finance to provide capital for prosecuting condemnation proceedings. Leasing of water rights by the state would be made legal, and municipalities or utility districts would be permitted to issue revenue bonds and to enter into leases for utility properties. As this is written two of the proposed measures had been voted down in committee and it is doubtful if the third will reach the floor of the legislature.

It is difficult to translate the actions of these latest promoters of municipal ownership into terms of public welfare or into a sincere belief in the soundness of the theory of government ownership and operation. There are profits to be made in building and leasing power plants and selling electrical energy, particularly when there is no regulatory body to supervise rates or service, as in the case of municipally owned utilities. Moreover, by the terms of the measures proposed to the legislature the lessors would not be subject to regulation or to the need of securing certificates of public convenience and necessity, as all of their dealings would be with municipal corporations.

One may reasonably assume that this newest group of advocates of government ownership will be even more dangerous than the others for they have an even greater selfish interest to promote. They, too, have as a fertile field in which to work that great mass of voters who through delusion or misinformation believe that as soon as government takes a hand in business, costs are miraculously cut in half. In the light of these latest developments it behooves the utilities to be even more zealous in informing the public of the advantages of private initiative and enterprise under government regulation in the furnishing of so essential a service as electric light and power.

Range Wiring Specifications Not Designed to Include Water Heaters

ON trial for a year upon the recommendation of the California Electrical Inspectors Association, the minimum range wiring specifications for installations in old houses seem to have been met with an open mind by a majority of California municipalities. Out of 130 communities where inspection and regulation of wiring exists it was reported at the recent P.C.E.A. Commercial Section conclave that 100 are giving the specifications a trial. Nine have made a slight reservation. Of the remaining cities unheard from it is estimated that not more than a half dozen are definitely opposed even to this trial.

The one objection voiced in regard to these minimum specifications is that some attempts have been made to make them fit both range and water heater. This they cannot be made to do.

From a physical standpoint the three No. 6 wires carrying both range and water heater will not give the consumer the service to which he is entitled. The 60-amp. switch is not large enough to accommodate both loads.

It is not good business to sell a customer means of receiving service which are inadequate to his needs. The electric range already has suffered too much from lack of surplus capacity in the past. To limit facilities supplying energy to a range is to court trouble, dissatisfaction and eventual sales resistance.

Neither is it keeping faith with the California inspectors. Willing to co-operate in a program which would benefit the industry by making the range easier to introduce into many homes, these men agreed to a field test for a year on a specific case. Abuse of the privileges granted cannot but result in more stringent regulation than ever.

As there seems to be a genuine need for similar standard minimum specifications for range and water heater together, it is only right that these should be sought in co-operation with the inspectors' association at its convention in September. Until that time neither the present range specifications nor the possibilities of a future range and water heater minimum should be jeopardized by the misuse of the present trial wiring standard.

Competition Is With the Past

WHETHER it be in the number of home runs made, Red Seal Homes built or refrigerators sold, the time comes when the greatest competition to be faced is that of last year's record. In comparison with other competitions this becomes more alarming, more difficult to meet and to conquer. Once established, this new achievement sets up its own competition until it, too, is topped.

It is well to keep one's eyes on this competition. Attention to it will keep thoughts from wandering into foolish and unproductive combat with other external rivalries. Concentration on whipping this one record will prove so absorbing, so comprehensive that the records of outsiders may well be passed in the process.

Such internal competition, such intimate competition, is the thing which will keep man or organization young, striving, progressive and increasingly useful to the world. Neglect to face and meet this competition with the past means stagnation; it means that the top has been reached and the decline must shortly begin.

There is on other competition so drastically important.

When Every Employee Is an Enthusiastic Salesman

IRRESPECTIVE of rates or service, technical advances or financing, the electrical industry is confronted by a sales problem of major proportions that must be solved. Developments of the past two or three years have served to convince executives of the necessity of sales programs, but to date this selling thought has not been carried down through the rank and file of power company organizations.

When John, meter reader, and Helen, counter clerk, speak to their friends and acquaintances, they speak as electrical experts, for do they not work for an electric company? When John and Helen and their thousands of counterparts throughout the industry open their mouths, they are not merely John and Helen, but they *are* the electrical industry.

No executive of the industry today can sit back complacently and imagine that because he is aware of the pressing need of an active sales plan the rank and file of his employees are equally conscious of this necessity. If this industry is to achieve success in the present-day highly competitive scramble for a share of the customer's dollar, every single employee of an electrical utility must be ready and willing to spread the gospel of electrical service.

Two things must be done to bring this to pass: first, the necessary information regarding electricity and its multifold uses must be furnished every employee; second, every employee must be imbued with an enthusiasm for the task of selling to the public the idea of using more electricity.

The burden of example and of proof lies with the man who has an organization under him, be he vice-president, department head, or district manager. He must carry the story of electricity, together with the necessary sales enthusiasm, to his group.

Electricity is cheap, but this fact alone will not bring about a 100 per cent beneficial use by the public without the added force of an industry united in concentration on sales.

Capitalizing on Association Activities

FOR the second successive year the Southern California Edison Company has led all companies in the territory of the Pacific Coast Electrical Association in the number of essays submitted in the contest conducted by the customer relations committee. In the contest just closed Edison employees submitted 910 essays out of a total of 1,209 received.

The 1929 essay contest was on the subject, "Why I Would Like to Own a Red Seal Home." Certainly here is a subject of vital importance to the light and power companies, for the Red Seal program can succeed only in proportion to the amount of energy the industry expends in promoting it. With the exception of the Edison company and one or two other companies, the opportunity offered was overlooked.

Co-operative activities, such as the California Electrical Bureau, the National Electric Light Association and the Pacific Coast Electrical Association, are costing thousands of dollars each year, and the power companies are carrying the major portion of the financial burden. These organizations initiate programs and inaugurate movements for the definite benefit of the industry.

Seemingly the Southern California Edison Company is endeavoring to the best of its ability to capitalize on the amount of time and money being spent on the activities of these associations. Naturally both employees and company benefit. Until the executives of other companies emphasize the advantages to be obtained from active participation in programs developed by these associations, they may count a goodly proportion of their investment in them as lost.

Wives as an Example of Sales Resistance

SOME unwritten law of perversity seems to dictate that wives shall never accept the word of their husbands—for anything which has to do with the household, at least. Some wives, of course, go farther than the threshhold of the home in carrying out the spirit of this law. With such the electrical industry cannot very well concern itself, but as far as electric ranges and other household electrical servants are concerned the problem is a perplexing one.

As a matter of record there are so many wives of electrical men who cannot be pursuaded to cook elec-

trically that something ought to be done about it. Just what can be done about it is likewise a problem. The husbands, in most cases, have done their best. In many cases these same wives have attended innumerable cooking schools, demonstrations and other forms of gentle persuasion and shining example, all to no avail.

When at last an electrical wife—not by any means of the televox sort either—succumbs to electric cooking it is due to some influence entirely outside the husband's control. Either she is convinced by a dear woman friend who has an electric range, or she moves into a summer vacation house equipped with a range, or in some mysterious manner, purely feminine, is brought to realize that what she has heard and seen relative to electric ranges is not merely sales talk.

Sometimes, under such circumstances a wifely belief in her husband's word is rekindled. Sometimes not even the blessings of an electric range can be expected to accomplish so much.

Certainly something ought to be done about it, but just what, and by whom, is as trying a question as that which confronted the conclave of mice who decided to have a bell placed on the cat's neck.

A Great Record of Communication Progress

THE telephone, like the electric light, has become so commonplace in the United States as to be accepted as a matter-of-fact item in everyday life. Yet the history of the telephone business, and particularly the developments of the last few years, challenge the imagination of a modern Bellamy.

Thus the annual report of the American Telephone and Telegraph Company for 1928 reveals that 59 per cent of the world's telephones are in the United States. This country's telephones number over 19,000,000, and the average daily conversations exceed 59,000,000. One may lift the receiver from the hook and obtain a connection with any one of 85 per cent of the world's telephones, including practically every country in Europe.

In the United States there is one telephone to each six of the total population. In Canada the average is one for each eight. No other country exceeds one for ten; but six have a higher average than one for each twenty of population; the world average is one for each sixty. In this connection it is interesting to note that San Francisco, with one telephone for each three of population, heads the list of cities of the world.

While it is true that research, development and engineering have been largely responsible for the remarkable progress these few figures indicate, it is also pertinent to offer the reminder that this progress was achieved under private ownership.

Light's Golden Jubilee— a Tribute to Edison

LIGHT'S Golden Jubilee, a celebration in commemoration of the fiftieth anniversary of the invention of the incandescent lamp, is going to be the occasion for a great blaze of lights throughout the entire country during the coming summer and fall. Nation-wide observance of the golden jubilee of electric light starts with the N.E.L.A. convention in Atlantic City in June and culminates with the dedication of the Edison Institute of Technology on Oct. 21 in Dearborn.

It is difficult to realize the tremendous influence that the electric light has had upon modern life. In inventing the incandescent lamp Thomas A. Edison performed a service to mankind unrivaled in the history of science and industry. It is particularly fitting that the golden jubilee of this invention should be made the occasion of national rejoicing. Not only are all of the branches of the electrical industry behind the movement, but other industries,—the national government and foreign nations have signified their intention of participating in the celebration. Plans already announced indicate that almost unlimited equipment and funds are available for making the jubilee a success.

The celebration presents opportunity for every city, every town and every hamlet to prepare decorative lighting installations tying in with the national theme. With an entirely disinterested motive opportunity is afforded the electrical industry to outdo itself in making the jubilee an historic occasion. The industry owes this tribute to Edison, the man whose genius has made the world free from darkness, increasingly productive, and above all a better place in which to live.

The Handbook—a New Sales Weapon

THE old-fashioned outside salesman carried a pack. In it were the wares he had to sell. To show them he unrolled his bundles of wares and the purchaser bought what he saw.

Then followed the traveling salesman with his sample cases. Still he may be seen unloading a number of trunks of wares upon the long tables of the hotel sample room. Here he brings his customers that they may see and order.

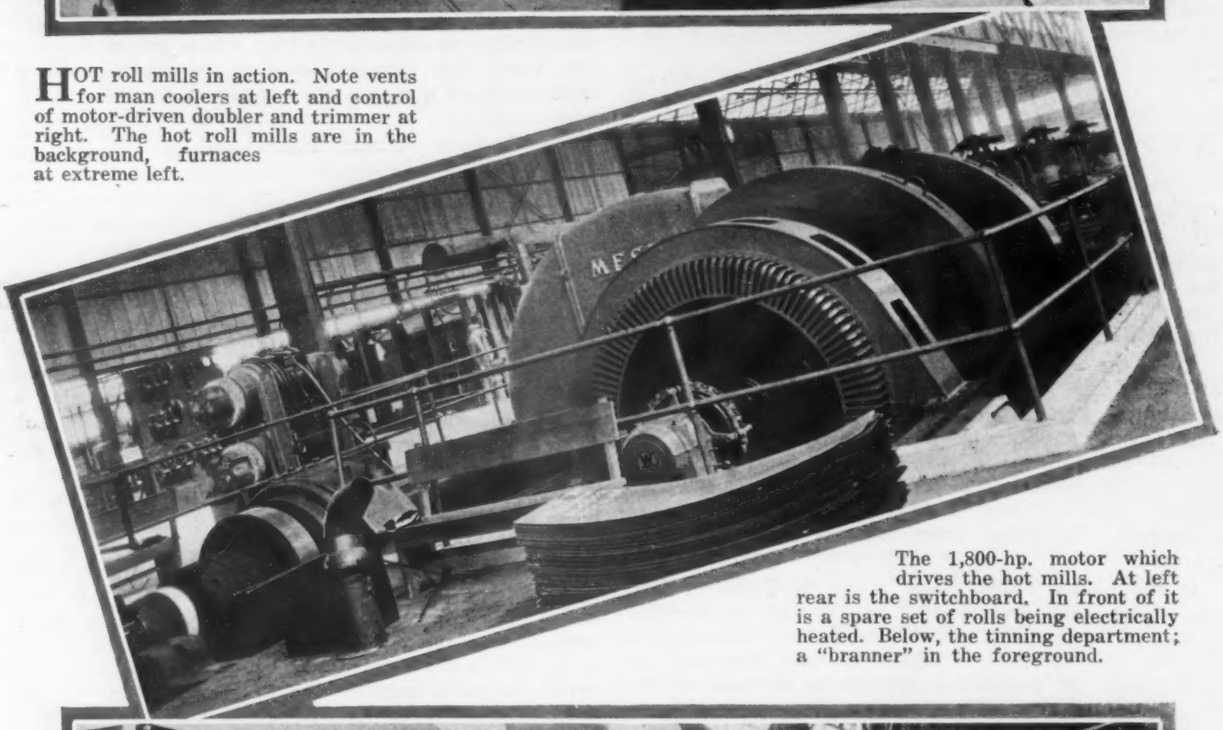
Except for the appliances or lamps which can be carried by the salesman from door to door, electricity cannot be sold that way. This is particularly true where the utilization machinery is large and heavy. Yet, because sales must be sought out in the very fields in which the use of electricity is to be made, because the day when the buyer will come to the office asking for service is gone, a new means of carrying the sales message, an ample substitute for the sample room or peddler's pack, has been developed. It is the salesman's handbook or manual.

At the recent commercial conclave of the P.C.E.A. six committees reported on handbooks already provided and under revision, or new and being issued for the assistance of electricity salesmen in their field sales efforts.

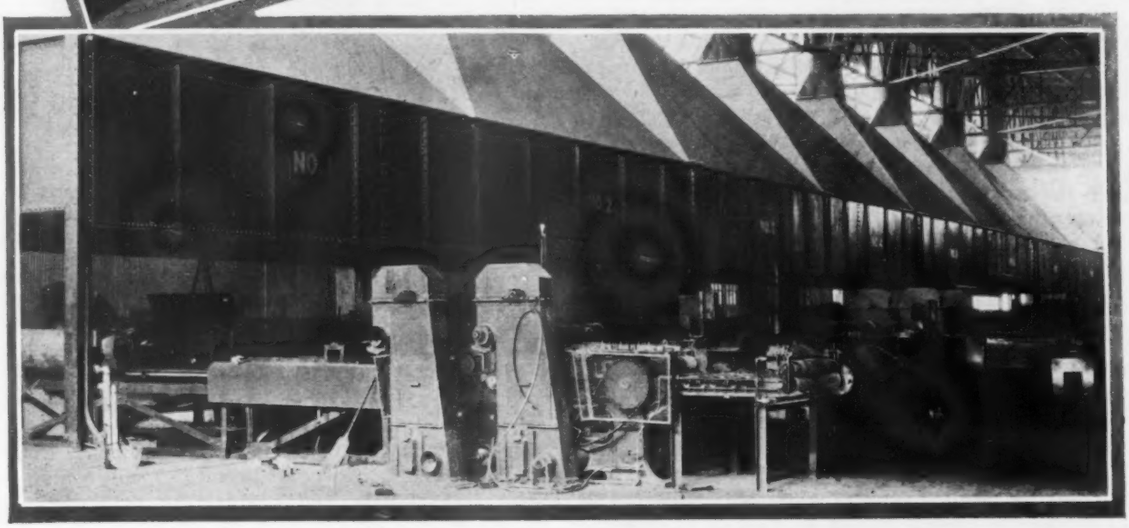
This tendency toward the printed "sample table" is a healthy one. It indicates that reliance is being placed more on useful data and less on overwhelming "personality." It shows a tendency to make use of publications, trade journals, association pamphlets and other useful and authoritative information. It presages the day when the most intelligent and therefore the best and most satisfactory selling will be done.

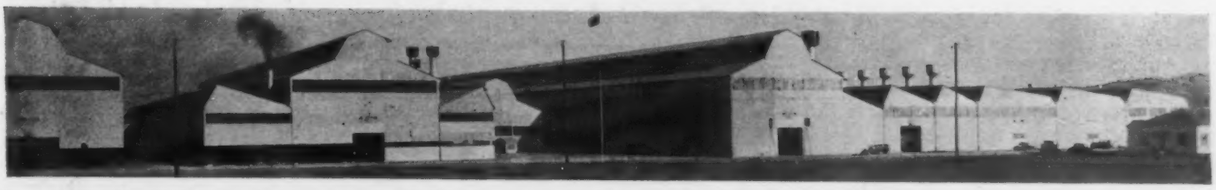
One more thing it accomplishes. The sales manual or handbook removes the necessity for making poll parrots out of salesmen. It sets them upon a basis akin to engineering, since it predicates all selling effort upon factual data and engineering principles. After all, no better basis for sales can be asked than this.

HOT roll mills in action. Note vents for man coolers at left and control of motor-driven doubler and trimmer at right. The hot roll mills are in the background, furnaces at extreme left.



The 1,800-hp. motor which drives the hot mills. At left rear is the switchboard. In front of it is a spare set of rolls being electrically heated. Below, the tinning department; a "branner" in the foreground.





The main buildings of the tin mill cover eight acres of ground. The buildings from left to right are: bar yard, hot mill, annealing and cold roll mill and tinning department. Administration building is at extreme right.

5,000 Hp. Employed in MAKING TIN PLATE

Varied Power Applications and Close Automatic Control Feature Columbia Steel Corporation's Modern Plant at Pittsburg, Calif.

By N. A. BECKER
Consulting and Efficiency Engineer, Columbia Steel Corporation.

ON SEPTEMBER 11, 1928, a crop of hay was harvested from a large acreage in Pittsburg, Calif. At eleven o'clock sharp the next morning, Sept. 12, a spade broke ground there for the new $2,500,000 tin plate mill of the Columbia Steel Corporation.

On March 12, 1929, at 11 a.m., six months to the minute later, "Mr. Televox" set in motion the wheels of the plant. From it began a harvest of a crop of tin plate, the first in the west, but destined to be perpetual.

In these six months had sprung from the hayfield adjacent to the steel corporation's mills five huge steel buildings, comprising the first eight-mill unit of an ultimate 44-mill plant. With them came a boiler house, a substation, an administration building and a full complement of service and personnel buildings. A western mill had begun making tin plate for the western canning industry.

NEW plant has more than 140 motors ranging from 1/6 to 1,800 hp. with total connected load of over 5,000 hp. Monthly consumption of entire Pittsburg plant now exceeds 3,500,000 kw.-hr. Present installation of eight-unit tin plant is first development of proposed 44-unit project.

With more than 140 electric motors ranging from 1/6 to 1,800 hp., and with a present connected load in excess of 5,000 hp., this new tin plate mill represents the very latest in tin mill design. It is distinguished still further by the fact that it is the first tin plate mill to be placed in operation west of Chicago and thus it constitutes an important step forward in the West's industrial development.

HEAVY POWER LOAD

The Columbia Steel Corporation's Pittsburg plant is a heavy user of electrical energy. At the present time it uses between 3,500,000 and 4,000,000 kw.-hr. per month with a definite expectation of increasing this consumption to 5,000,000 kw.-hr. per month or more in the near future. The progressive attitude of the plant management with regard to electric equipment perhaps is best emphasized by the simple statement that, of a total of 33,000 installed motor horsepower serving the plant's various mills, 13,400 hp. is in slow-speed synchronous motors, two of which are rated at 5,000 hp. each.

The new tin mill has a capacity of 750,000 100-lb. boxes of tin sheets per year and buildings have been built to take care of additional equipment that will raise this production capacity to 1,125,000 100-lb. boxes annually, as the growing demand for its product dictates.

Using raw materials produced entirely in the West, with the exception of the tin itself, the mill will manufacture tin plate to meet the demands of the western canning industry. Pig iron comes from the company's Utah blast furnaces where western iron ore and western-made coke are used in the process of reduction.

To the Pacific Coast users of tin plate the advent of this mill is of particular importance, since it presages a local supply of tin plate which can be delivered direct without transcontinental transportation costs and without the 10 per cent loss resulting from handling and rust in Eastern shipments.

ELECTRICITY'S PART IN THE PLANT

The mill is modern in every detail, combining the latest designs of steel-mill and tin-plate engineers and presenting perhaps the foremost example of this sort of industrial development in the United States.

Electricity and electrically controlled apparatus of many kinds play a most important part toward the attainment of the goal of the mill—to produce a quality product under the most efficient operating conditions. Careful attention has been given to illumination to provide adequate and shadowless lighting for the various processes throughout the mill. Automatic equipment for the control of electrical and other

machinery makes for greater operating efficiency as well as providing a much more accurate control of important steps.

Working conditions also have been given attention through the provision of proper illumination, convenient installation of electrically-cooled drinking fountains, blowers for delivering fresh, cool air to workmen operating the ovens and hot rolls, and further provision of adequate safety features. Men's and women's "change rooms" provide further for employees' needs, in particular the women's quarters where electric heaters and many electrical appliances contribute to personal comfort.

The Process—Hot Mill

Raw material for the tin mill comes to it in the form of "tin bar" or bars of steel approximately 3/8 in. thick and 8 in. wide, delivered from another portion of the plant. This material first passes through electrically driven shears where it is measured automatically and cut to the proper length, according to the size and weight of sheet that is to be produced. These measured lengths are stacked upon skids which are picked up by gasoline-driven pick-up trucks, delivered to the scales for weighing and then to the rear of the sheet and "pair" furnaces for treatment.

The bar sections are fed in batches into the rear of a continuous-process furnace in which they are heated and from which they are withdrawn for the hot-rolling process. The initial hot-rolling step is continued as long as material temperature will permit and then the sheets are withdrawn and placed in a motor-driven mechanical "doubler" which doubles the sheets into a "book." The doubled sheets are placed in the "pair" furnace and reheated to a workable temperature and then they are given a second step in the hot-rolling process.

In the processes just described electricity plays an important part. The stacks of cut bars delivered from the vertical shears are pushed into the rear of the sheet furnace by means of electric "pushers," driven by 7.5-hp. d.c. totally enclosed mill type motors.

The doublers are driven by 7.5-hp. d.c. motors, one for each of the eight hot rolls. The oil-fired sheet and pair furnaces are completely subject to the control of electric equipment.

The oil supply for these furnaces is delivered to an automatic, electrically controlled "viscosity" device which operates to maintain a constant viscosity and a constant pressure of oil delivered to the furnace burner. Through the electro-mechanical equipment of this device the oil is steam-heated to the proper temperature and full control of both viscosity and pressure is maintained automatically, regardless of furnace demands. Both forced and induced draft is supplied for each of the eight pairs of furnaces, divided into two groups of four each. These fans are driven by electric motors.

1,800-Hp. Motor

There are eight 28 x 34-in. hot mills in two trains of four each, driven by an 1,800-hp., 252-r.p.m., 2.3-kv.

List of Most Important Motors and Their Applications

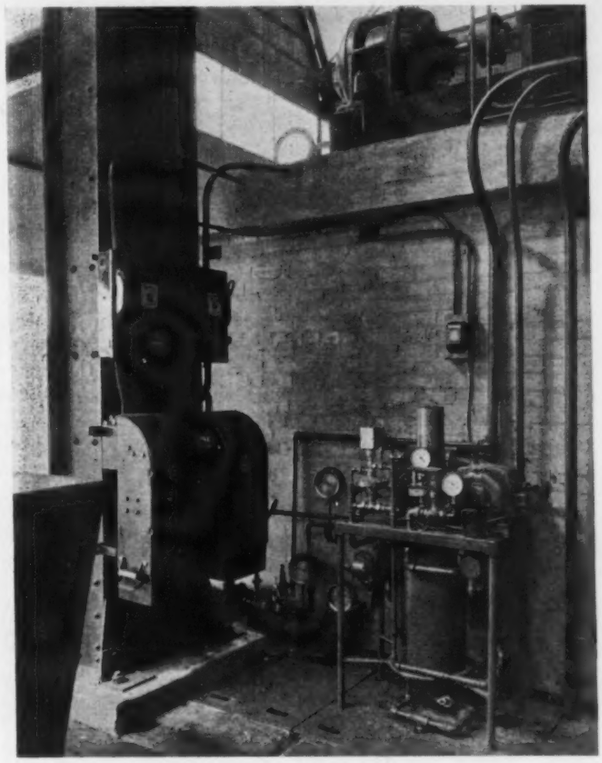
No.	Purpose	Maker*	Type	Speed (r.p.m.)	Voltage	Hp.	Total Hp
PUMP HOUSE							
3	Deep-well pumps	U.S.	Induction, 3-phase	3,600	440-220	40	120
TIN HOUSE							
1	Slitter	G.E.	Induction, 3-phase	1,150	440	5	5
8	Tinners	G.E.	Shunt-wound, d.c.	475-1,900	230	5	40
8	Dry cleaners	G.E.	Compound-wound, d.c.	850	230	15	120
1	Roller leveler	G.E.	Compound-wound, d.c.	850	230	10	10
1	Pack opener	G.E.	Shunt-wound, d.c.	1,150	230	3	3
1	B-Q viscosity pump	G.E.	Repulsion-induction	1,770	110-220	1	1
1	Magnetic bran cleaner	G.E.	Induction, 3-phase		440	3	3
1	Bran screening	G.E.	Induction, 3-phase	1,160	440	3	3
2	Frigidaire water cooler	Frigd		1,760	110-220	½	1
2	Lincoln arc welders	Lincoln		1,800	440	10	20
1	Can machine	G.E.	Induction, 3-phase	1,155	440	3	3
MACHINE SHOP							
1	Emery wheel	West.	Induction, 3-phase	1,160	440	20	20
1	Roll turner	G.E.	Shunt-wound, d.c.	500-1,500	230	1	1
1	24-in. lathe	West.	Induction, 3-phase	1,160	440	10	10
1	18-in. lathe	West.	Induction, 3-phase	1,160	440	5	5
1	14-in. lathe	U.S.	Induction, 3-phase	1,200	440	3	3
1	Milling machine	U.S.	Induction, 3-phase	1,200	440	7½	7½
1	Shaper	West.	Induction, 3-phase	1,750	440	5	5
1	Drill press	West.	Induction, 3-phase	1,160	440	10	10
1	Drill press	West.	Induction, 3-phase	1,160	440	3	3
1	Emery wheel	U.S.	Autostart, 3-phase	1,800	220-440	2½	2½
1	Emery wheel	U.S.	Autostart, 3-phase	1,800	220-440	1	1
1	Hobber	West.	Induction, 3-phase	1,750	440	5	5
1	Planer	West.	Induction, 3-phase	1,750	440	10	10
1	Hack saw	West.	Induction, 3-phase	1,750	440	1	1
2	Grinder motor-generator sets	G.E.	Induction, 3-phase	3,600	220-440	1½	3
1	Carriage	G.E.	Shunt-wound, d.c.	1,724-3,450	230	¼	¼
1	Headstock	G.E.	Shunt-wound, d.c.	3,450	230	⅛	⅛
ANNEALING BUILDING							
1	Blower	G.E.	Induction, 3-phase	3,600	440	20	20
1	Blower	West.	Induction, 3-phase	1,750	440	75	75
1	Cold rolls	West.	Slip ring, 3-phase	238	2,200	1,000	1,000
1	Oil pump	G.E.	Induction, 3-phase		440	1	1
1	Furnace charger	West.	Series, mill-type, d.c.	600-700	230	12-15	12-15
1	Black pickler	G.E.	Compound-wound, d.c.	1,150	230	7½	7½
1	10-ton crane bridge	G.E.		1,140	440	30	30
1	10-ton crane hoist	G.E.	Slip-ring, induction	1,130	440	50	50
1	10-ton crane trolley	G.E.	Slip-ring, induction	855	440	7½	7½
1	30-ton crane bridge	G.E.		1,125	440	40	40
2	30-ton crane hoists	G.E.	Slip-ring, induction	1,130	440	50	100
1	30-ton crane trolley	G.E.	Slip-ring, induction	1,165	440	10	10
1	B-Q viscosity pump	G.E.	Induction, single-phase	1,770	220	1	1
1	Frigidaire water cooler	Frigd		1,760	110-220	½	½
POWER HOUSE							
1	Air compressor	G.E.	Synchronous, 3-phase	180		438	438
1	Motor-generator set	West.	Synchronous, 3-phase	1,200	4,000-2,200	290	290
1	B-Q viscosity pump	G.E.	Induction-repulsion	1,770	110	1	1
HOT MILL							
8	Pushers	G.E.	Series-wound, d.c.	800-3,200	230	7½	60
8	Doublers	G.E.	Compound-wound, d.c.	850	230	7½	60
2	Man cooler blowers	G.E.	Induction, 3-phase	870	440	30	60
2	Furnace blowers	G.E.	Induction, 3-phase	3,350	440	25	50
2	Furnace exhausters	G.E.	Induction, 3-phase	680	440	20	40
2	Viscosity pumps	G.E.	Induction-repulsion	1,770	110	1	2
7	Frigidaire water coolers	Frigd		1,760	110-220	½	3½
1	Servel water cooler	G.E.		1,725	110-220	1/6	1/6
1	Hot mills	West.	Slip-ring, 3-phase	252	2,200	1,800	1,800
1	Oil pump	G.E.	Induction, 3-phase	1,130	440	1	1
1	Sump pump	G.E.	Induction, 3-phase	865	440	30	30
10	Square shears	G.E.	Compound-wound, d.c.	1,150	230	7½	75
2	Roll lathe	G.E.	Shunt-wound, d.c.	300-1,200	230	25	50
2	Roll lathe oil pumps	H-C.E.	Shunt-wound, d.c.	1,725	230	½	1
1	Tool grinder	U.S.	Induction, 3-phase	1,200	440	5	5
1	30-ton crane bridge	G.E.		1,125	440	30	30
2	30-ton crane hoists	G.E.	Slip-ring, induction	1,130	440	50	100
1	30-ton crane trolley	G.E.	Slip-ring, induction	1,165	440	10	10
1	Scrap baler	G.E.	Induction, 3-phase	580	440	75	75
BAR YARD							
1	Shear approach back rolls	G.E.	Series-wound, d.c.	725-3,200	230	10	10
1	Shear front rolls	G.E.	Series-wound, d.c.	725-3,200	230	10	10
1	Crop chute conveyor	G.E.	Shunt-wound, d.c.	400-1,600	230	10	10
1	Vertical shear	G.E.	Induction, 3-phase	630	440	20	20
1	Shears	G.E.	Induction, 3-phase	1,800	440	15	15
1	Screw pump	G.E.	Induction, 3-phase	1,165	440	30	30
1	10-ton crane bridge	G.E.		1,140	440	30	30
1	10-ton crane hoist	G.E.	Slip-ring, induction	1,130	440	50	50
1	10-ton crane trolley	G.E.	Slip-ring, induction	855	440	7½	7½
130							5,139

*Abbreviations used: U.S.—U. S. Electrical Manufacturing Company. G.E.—General Electric Company. Frigd.—Frigidaire Corporation. Lincoln—Lincoln Electric Company. West.—Westinghouse Electric & Manufacturing Company. H-C.E.—Holtzer-Cabot Electric Company.

wound-rotor induction motor, operating through an enclosed herringbone reduction gear, giving a roller speed of 29.6 r.p.m.

Complete control of this 1,800-hp. motor is effected through a master switch having a "forward" and "reverse" position. Operation of the master switches to either of the operating positions sets in motion the automatic starting equipment which operates through a system of current-limiting contactors to bring the motor up to speed with a minimum power demand.

The motor control is interlocked with the bearing oil pressure units, a protective step which insures proper lubrication on all of the heavy bearings of the hot-mill



Control station for motor-driven forced and induced draft fans on hot mill furnaces; and right, viscosity control device, delivering oil at burners at constant pressure and viscosity.

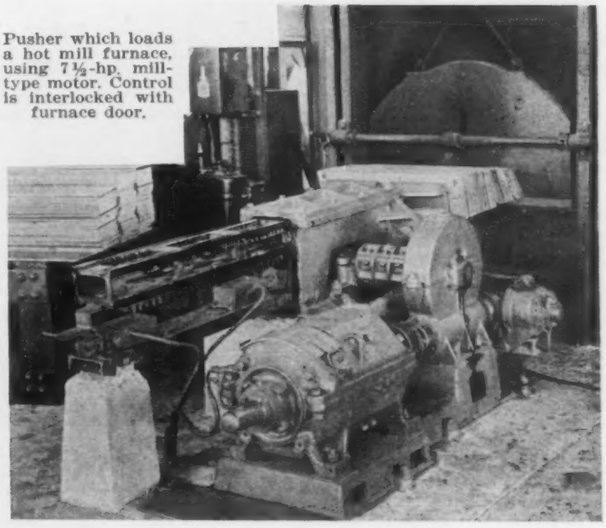
rolls before the motor is allowed to start the mill. The motor itself is equipped with an external resistor which is designed to allow a 10 per cent slip on overloads, thus allowing the flywheel to take the peak load and reduce the electric power demand accordingly.

Strip Heaters Keep Rolls Hot

Another very important electrical installation in the hot mill department is the strip-heating equipment for heating electrically the rolls when the mill is shut down. When the hot mill is shut down from Saturday noon until Monday morning, these electric roll heaters are clamped to each pair of rolls and the four heating units connected in series (to give low heat) across the outside legs of a three-phase, 440-volt a.c. circuit. Thus unnecessary stresses and damaging strains within the rolls are obviated.

Another reason for keeping the rolls at such a temperature is that by connecting the elements in parallel across the 440-volt, three-phase circuit, perhaps three hours before the mill is returned to service, the rolls may be brought up to the desired economical operating temperature of approximately 650 deg. F.

Pusher which loads a hot mill furnace, using 7½-hp. mill-type motor. Control is interlocked with furnace door.



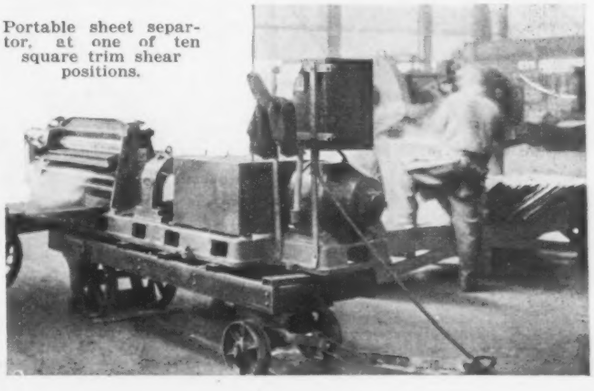
Still another application of these roll heaters is made in keeping a pair of rolls heated all the time in case of an emergency which would arise if a pair of rolls were damaged and needed replacement. The rating of these roll heaters is approximately 15 kw. when connected in series for low heat, and 52 kw. when connected in parallel for high heat.

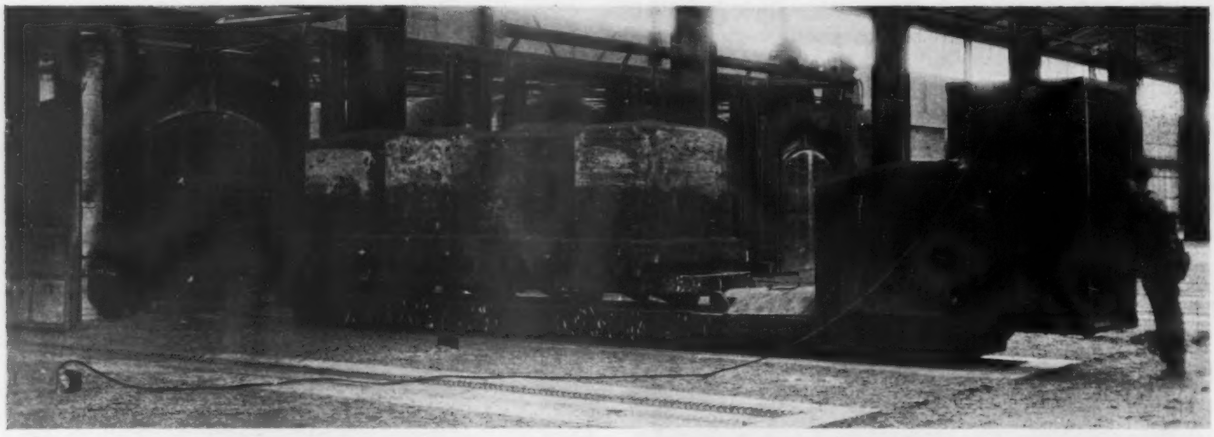
Black Pickling and Annealing

When the tin sheet has been rolled to the proper predetermined thickness in the hot mill it is gathered up by gas-electric trucks and delivered to the trimming department where the "books" of sheets are broken down by hand to individual sheets and each one is trimmed to proper dimensions, stacked on skids and then delivered to the black pickling department. For such sheets as may stick together and cannot be opened by hand a portable motor-driven "opener" together with an operating crew of two men is provided to serve the eight trimming machines.

From the black pickling department where the initial acid-cleaning process takes place, the sheets are passed through drying ovens and stacked on "bottoms" in preparation for the black annealing process. When the proper number of sheets have been stacked on a given bottom they are completely covered by a heavy steel annealing "box" which is inverted over the stacks of sheets and sand-sealed to the bottom. This arrangement assures an even heat treatment throughout the stacks of sheets. When these annealing boxes have been completely assembled, they are picked up by means of an

Portable sheet separator, at one of ten square trim shear positions.

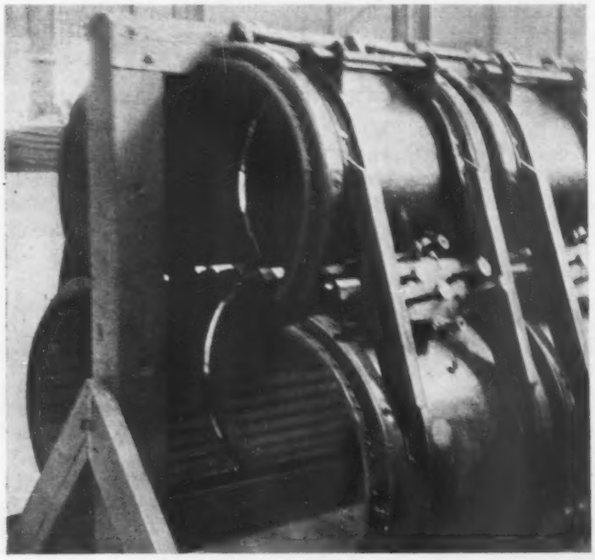




Portable charger for annealing furnaces, using 12-15-hp. d.c. motor. It is lifted from track to track by the overhead crane. Note portable plug connection.

overhead crane and placed on the motor-driven annealing furnace loader.

This loader is a development of the engineers of the Columbia Steel Corporation and comprises an electrically-driven rack-and-pinion locomotive driven by a 7½-hp. d.c. motor. It is utilized to push the cars and their



Two sets of electric roll heaters. Before shutting down the hot mills these are clamped to the rolls. Connected in series each set uses 15 kw. for low heat; in multiple 52 kw. for high heat.

load into and to remove them from the annealing furnace. Only one of these "locomotives" is provided. It is lifted from track to track by means of the overhead cranes, thus serving the nine black annealing furnaces and the three white annealing furnaces in the same building.

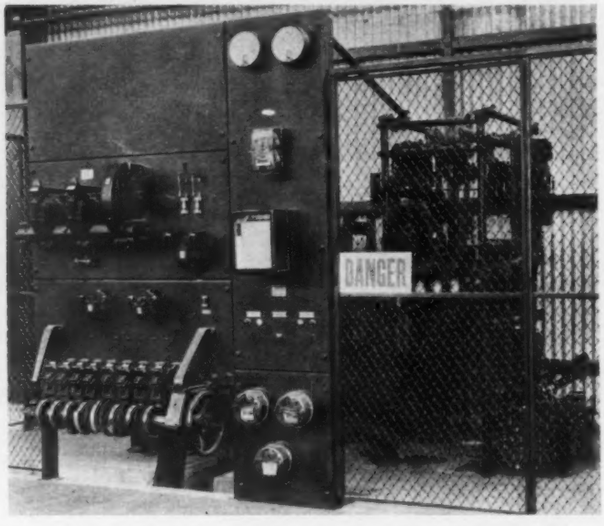
The black annealing furnaces are oil fired and equipped with both forced and induced draft supplied by motor-driven fans. Recording pyrometers provide a continuous record of furnace temperature and temperature of the sheets under treatment.

An experimental installation of automatic electric equipment has been made on one of the black annealing furnaces. This equipment consists of special contact-making pyrometers and the necessary related automatic control equipment to enable these contact-making pyrometers to control automatically the furnace fires, maintaining temperatures constant at predetermined values. Here again as well as on all oil-burning equipment in the plant, the automatic electrically controlled viscosity device delivers oil at constant viscosity and constant pressure to the furnace burners.

The Cold-Roll Mill

From the black-annealing furnace the sheets pass through a hand-separating and sorting stage and thence through the cold-roll mill.

The cold-roll mill as installed consists of three three-stand rolls in tandem driven by a 1,000-hp., 236-r.p.m., 2.3-kv. wound rotor induction motor, through enclosed herringbone reduction gears. These gears are designed to give a roll speed of 45.4 r.p.m. on the first set of rolls, 47.4 r.p.m. on the second set, and 49.6 r.p.m. on the third set. Belt conveyors carry the tin plates automatically from the first through the third band of cold



Automatic control panel for the 1,000-hp. cold roll mill motor. A unique feature is shown in the motor-driven contactor at the bottom of the panel which provides predetermined step-by-step starting regardless of power demand.

rolls. The present installation of cold rolls is designed to accommodate six more 24 x 44-in. mills in addition to the nine now in service.

Electric control for the 1,000-hp. motor driving this mill is of peculiar interest because of the comparatively high starting load thrown upon the motor when the cold mills are started from standstill. Similar to the hot-mill drive, control is effected manually through a

master switch conveniently located on the roll mill. However, the automatic starting equipment operates in such a way as to provide forced acceleration for the motor, thus assuring its starting regardless of possible power demand for starting purposes.

Forced Acceleration on Motor

This forced acceleration is provided by means of a motor-driven contactor which gives a definite step-by-step forced acceleration at predetermined time intervals depending upon the gear ratio between motor and contactor assembly, and operating regardless of motor currents. Thus starting current is fed to the motor in successively increasing steps until it starts and comes up to operating speed.

From the cold mill the sheets are restacked on bottoms and sand-sealed again in annealing boxes for the white-annealing process. This process is similar to the black-annealing step except that the average temperature of material is approximately 1,150 deg. C. instead of approximately 1,400 deg. C., as in the black-annealing process. From the white-annealing furnaces the sheets go through a "white pickling" bath after having been separated, sheet by sheet. When the sheets leave this second pickling bath they are absolutely clean and free from scale and surface impurities and are ready for the tin-plating process.

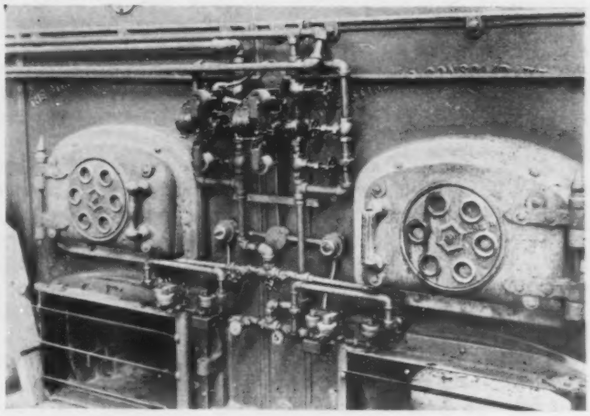
A certain amount of tin sheet is held in intermediate storage between the second pickling bath and the "tin pots." These sheets are stored immersed in a very weak acid solution, in metal containers, thus obviating the possibility of oxidation.

Tinning the Plate

The finishing department of the plant comprises the tin house, the assorting room and several warehouses. In the tin house there are eight 64-in., two-way tinning units complete with electrically-driven rolls and electrically-driven conveyors and polishers.

Each of the eight units is provided with an automatic electro-magnetic feeder and extensive interlocking automatic protective features. The "tin pots" are oil fired with the previously mentioned automatic electrically-controlled viscosity device and are served by a 5-hp. variable-speed motor on the tin-pot rolls and a 15-hp. motor driving the conveyors and the "branner" or polishing machine.

Rolled and cleaned sheets are taken from the intermediate storage and placed in the feed shelf of the tin pots. A magnetized roll picks up one sheet at a time and feeds it into a succession of roller pairs which carry it down through the molten tin bath and then through a palm-oil bath, finally dropping the tin-plated sheets onto a roller conveyor for delivery to the "branner."



Two 300-hp. boilers equipped with full automatic control for viscosity and pressure of fuel oil, fuel supply and dampers.

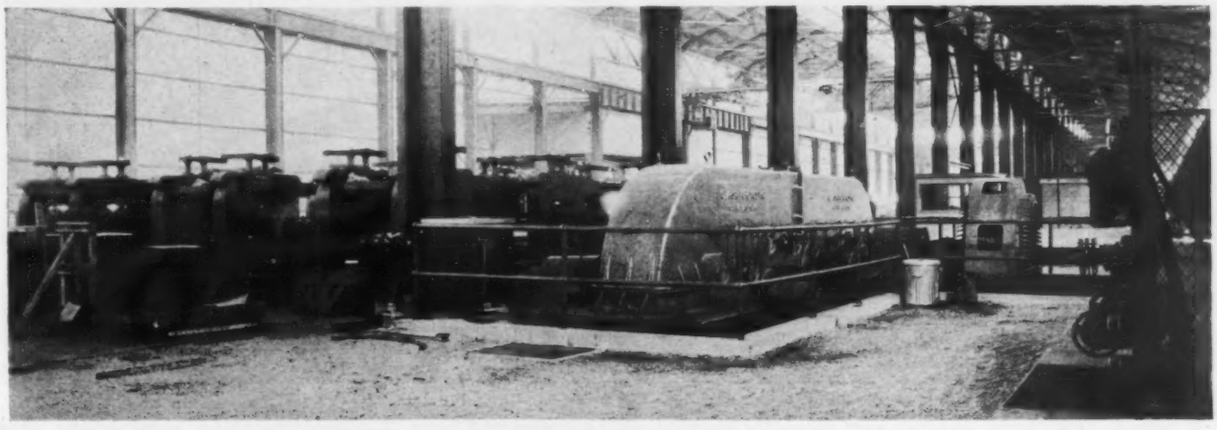
The pure molten tin is kept at about 650 deg. F. and at this temperature readily forms a strong mechanical bond with the steel sheet as it passes through. The passage of the tinned sheet through the palm-oil bath is a "fluxing" step resulting in a smoother plate and better bind between tin and steel.

The branner comprises a set of rolls encased in cotton flannel interspersed with the necessary conveyor rolls. Wheat middlings or bran are used in this machine as the abrasive polishing agent and also to absorb excess palm oil remaining on the sheets. The bran is constantly retrieved and fed back into the machine through a series of screw conveyors and distributors until it has served its useful life, after which it is sold for hog food.

An Electrical Tinning Unit

One of the eight tinning units will be an experimental, completely electrified unit. The tin pot will be electrically heated by means of twelve 10-kw. immersion heaters and the palm-oil bath by fourteen 4.5-kw. immersion heaters operating through automatic control and heat-regulating equipment. Particular attention is being given to the insulation of this equipment, a liberal filling of Silocel being used in the walls and foundation.

This completely electric unit will be given a thorough tryout under normal operating conditions and it is confidently expected by the plant management that the results of the experiment will lead to the electri-



The three 3-stand cold roll mills driven through herringbone gears by a 1,000-hp. wound rotor induction motor.

fication of the other seven tin pots and the electrification of new pots when they are added. From all-electrical operation is expected a more accurate temperature control and a closer regulation. These factors should more than offset any possible increase in installation or operating costs of the all-electric over the oil-fired unit.

Specifically, the advantages expected are: (1) close automatic control, holding temperature down to proper value and thus reducing wasteful evaporation of tin; (2) a saving in the use of tin because exactly the right coating may be given to the tin plate when the temperature is held rigidly at the proper value; (3) greatly decreased maintenance costs, since there is no fire box, or any excessively high temperature to care for; (4) efficient use of all available heat since heaters are immersed directly in the heated material.

From the branner machines the tin plates are conveyed to the sorting room by means of portable skids and gas-electric lift trucks. These gas-electric high-lift trucks are used because of their greater operating simplicity considering the service to which they are put.

Lighting for Inspection

In the sorting and inspection building particular attention has been given to the matter of illumination. Five-hundred-watt overhead units provide a general base illumination of 3.5 foot-candles on the working plane. This is supplemented by Cooper-Hewitt mercury vapor lights spaced on 9-ft. centers directly over the sorting and inspection tables giving a net total illumination on the working plane of 11 foot-candles.

In general, the lighting of the entire tin mill has been given particular attention. In the bar yard, fifty-five 500-watt lamps over a space 80 x 480 ft. give an average light intensity on the working plane of 4.5 foot-candles. In the main mill building the lighting intensity is 4.3 foot-candles on the working plane. In the cold-roll building an average of 5 foot-candles is maintained while in the furnace room and the tin house an average of approximately 3.3 foot-candles is maintained. In the power house also the intensity is 3.5 foot-candles. A total of more than two hundred and eighty 500-watt units and several 1,000-watt units are used in addition to many smaller units.

The Sheet-Bar Mill

To furnish sufficient sheet bar to keep the tin-plate mill running at its present full capacity, the Columbia Steel Corporation is now installing a seven-stand, 24-in. continuous mill which will also roll sheet-bar billets and tie plates. This seven-stand mill is driven by a single 5,000-hp., 82-r.p.m. synchronous Westinghouse motor which operates at 2,300 volts. These motors are the largest slow-speed synchronous motors built to date. They are especially designed for the rolling mill service in that they have a pull-out torque amounting to 250 per cent of full load torque and that they are capable of starting from dead standstill at 54 per cent of full load. The motor is completely automatic in its operation, requiring only a starting, stopping or reverse impulse from the master switch to institute all of the necessary intermediate steps through automatic relays and contactors.

Power Supply

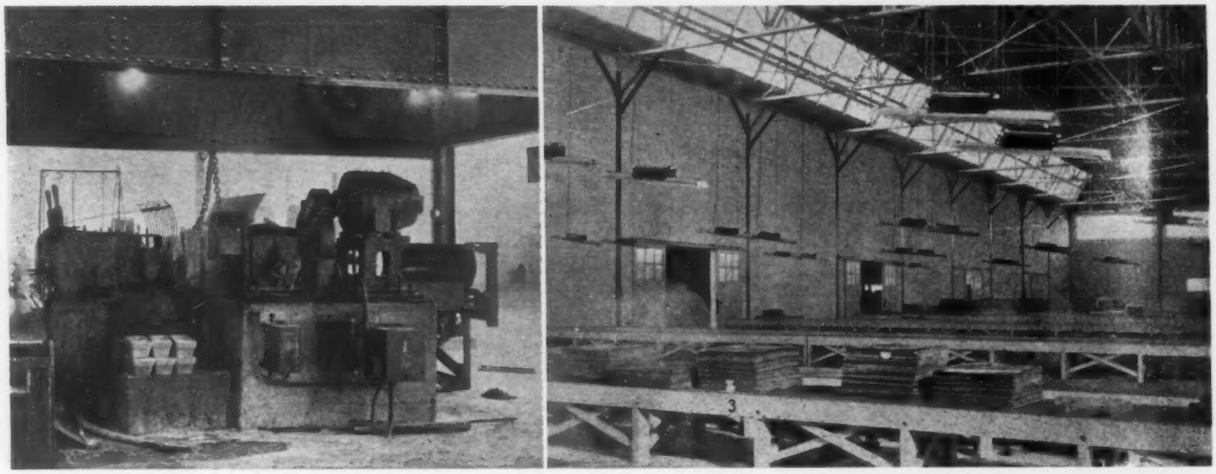
Electric power is delivered to the Columbia Steel Corporation by the Pacific Gas & Electric Company over three separate 60-kv. transmission lines coming from three different transmission substations, thus providing for service continuity. The power company maintains a large power station having a total installed transformer capacity of 20,000 kva. in the main station and in addition serving a 12,000-kva., 60/2.3-kv. transformer bank for the new tin mill and its related equipment only.

The steel corporation takes up the distribution of power from the 2.3-kv. bus, distributing it through its own underground cable distribution system to various subdistribution points located throughout the mill where the power is stepped down to 440, 220 and 110 volts for the various light and power applications.

Although the designs for the mill, whose steel frame and corrugated sheet buildings cover a total of eight acres of ground, were made by H. A. Brassert & Company, Chicago, the erection of it in practically every detail was carried out by the plant management at Pittsburg, under the direction of the author, N. A. Gary, chief engineer, and others of the staff.

All electrical work was installed also by crews from the plant under the supervision of A. B. Hubbard. Likewise a number of refinements of detail and control are attributable to the Pittsburg staff.

Extending to the east of the tin mill there lies still more hayfield. Its boundaries are lost to sight. Upon these acres still greater plants will be raised that the needs of the West for tin plate may be met in the crops of plate which will continue increasingly to come from this pioneer tin plate mill of the Pacific Coast.



Left: "Tin pot" where sheets of steel are separated by a magnetic roll, passed through a molten tin bath, then through palm oil and delivered to conveyor at right which takes them to the "branner" for polishing. *Right*: The inspection room lighted by 24 Cooper-Hewitt lamps. Glareless illumination on the working plane to the extent of eleven foot-candles thus is provided.

Extent of Lafayette Dam Slip Shown by Aerial Picture

RECENT aerial photographs of the Lafayette dam of the East Bay Municipal Utility District in Contra Costa County, Calif., give a clear conception of the extent and results of the earth slip that occurred in that structure. Designed as a 140-ft. earth-fill structure with a puddled clay core, the dam had reached a height of 120 ft. with approximately 94 per cent of the ultimate yardage in place on Sept. 17, 1928, when subsidence set in along the center of the crest. Within six days the top of the dam had settled 24 ft. at the crest with a consequent slumping of the downstream face until an area of approximately eight acres was involved. The central portion of this area was moved downstream about 20 ft. and pressure and movement resulted in the formation of a small ridge parallel to the axis of the dam along the downstream toe. The accompanying illustration clearly shows the area affected and the extent of the earth movement.

Upstream movement was comparatively slight with maximum horizontal displacement of 5.5 ft. and subsidence of 1.5 ft., with slight displacement of the concrete paving slabs.

A board of engineers appointed to investigate the unprecedented case attributed the cause to exceptional foundation conditions, notably the uncommon thickness of the plastic, clayey alluvium forming the foundation of the structure. This material reaches a depth of 90 ft. under the dam before the typical Orinda bedrock of the region is encountered. Overloading the foundation by a combination of height and steepness of slope produced compression in this alluvium that resulted in a subsidence of as much as 9 ft. This subsidence imparted movement to the materials of the dam itself with the result that much greater displacement occurred in the dam structure,.

Commenting upon the slip of the dam the investigating board stated, "Previous failures of earth dams by subsidence have usually been due to movement that originated in the embankment itself. Failure of a dam of this type caused by the plasticity of the underlying foundation has been extremely rare, if, indeed, it has ever occurred. . . . The consulting board is of the opinion that only in the light of exceptional experience could the mobility of this foundation material have been anticipated."

The board of investigating engineers recommended a modified program of reconstruction involving the limiting of the height of the dam to 100 ft. instead of 140 ft. and increasing the slopes to 5 to 1 and 7 to 1 on the upstream and downstream faces respectively.

The original storage provided will be cut from 10,590 acre-ft. to 3,700 acre-ft. The original contract price of $1,370,685 will be increased approximately $300,000.

Aerial view of the Lafayette dam of the East Bay Municipal Utility District to be used for impounding Mokelumne River water. Slippage of the extremely plastic alluvium of the foundation due to overloading produced consequent subsidence and displacement of the material in the earth fill dam, as shown in the picture. The excavations on the floor of the reservoir were made by steam shovels in producing the material from which the dam was built. *(Photo copyright by George S. Young, Oakland.)*

Selling the Electric Apartment House Idea in Los Angeles

WORKING on the theory that no apartment house is absolutely modern unless completely electrified, the Los Angeles Bureau of Power and Light is offering a service to architects, builders and owners that is producing results in apartment house electrification. A staff of engineers has been organized by the Bureau to assist in planning electrical installations, advertising is being carried in local organs reaching architects, owners and operators, and a comprehensive brochure entitled "Electricity in Modern Apartments" has been prepared for circulation.

Information is given on interior and exterior illumination, refrigeration, elevators, electric cooking, electric air and water heating, and all the problems that enter into complete electrification of an apartment building.

In advising regarding lighting installations, the effectiveness of planned lighting, color effects, elimination of glare, and decorative lighting are emphasized. Floodlighting is recommended to enhance the architectural beauty of the building and increase rental values. The use of Neon signs to advertise buildings effectively is urged. For proper installation of outlets the Bureau recommends that the Red Seal wiring specifications be followed. Elevators are recommended in every building over three stories in height. Proper ventilation, with individual units in kitchens and complete ventilating systems in larger buildings, is urged.

Refrigeration of the unit type in small buildings and the multiple system in larger ones is now standard, the Bureau points out. All of the advantages of the electric range, including the item of less frequent redecorating expense, are emphasized. On account of the highly favorable climatic conditions, electric air heating is recommended.

In selling the completely electrified apartment idea, it is pointed out that installation costs for wiring compare favorably with the costs of systems using other types of fuel. In comparing the cost of electric heating and cooking units with that of other fuels attention is called to the fact that electrical equipment eliminates steam boilers, steam-pipe lagging, return piping, radiators, space required for boilers, gas piping, and the additional space required for gas ranges.

Effective use is made of figures that are available covering the cost of operation of apartment houses in the city which are completely electrified. The Bureau recommends that the entire apartment house be metered through one service and an average charge for service be added to the rental of the individual apartments. Thus very low operating costs can be secured through the purchase of energy at industrial power rates.

The following tabulation is a record of the cost of electricity for the operation of a number of apartment houses and apartment hotels on the lines of the Bureau. The tabulation is segregated into three classes of installations, namely those having elevators, refrigeration, ranges and air heaters, those having elevators, refrigeration and ranges, and those having elevators, refrigeration and bathroom heaters.

Ranges and Air Heating

No. 1 Apartment Building. Complete equipment—85 ranges, total 640 kw., 285 space heaters, total 510 kw.; 37-hp. refrigerator equipment; elevator, etc., 64.2 hp.

There are 81 apartments—51 singles, 20 doubles, three 3-room, four 4-room, one 5-room, two 7-room apartments, and three store rooms.

Cost of electrical operation from Oct. 6, 1926, to Oct. 5, 1927:

	Kw.-hr.	Yearly Total	Monthly Average	Ave. Per Occ. Apt.
Light	74,858	$1,998.61	$166.55	$ 2.90
Elev., refrig.	134,360	1,953.38	162.78	2.92
Cooking, heating	510,425	5,053.44	421.12	6.36
All electric energy		$9,005.43	$750.45	$12.25

Average yearly cost per occupied apartment—singles, $44.49; doubles, $94.00; large, $176.24; all classes, $68.75.

No. 2 Apartment Building. Fifty-four suites—39 apartments and 15 bachelor units.

Electrical equipment—39 ranges and 135 space heaters, totaling 245 kw. and 286¼ kw., respectively, 5¼-hp. elevator and 2-hp. refrigeration.

Winter bill, high month:

Light	2,167 kw.-hr.	$ 81.01
Elevator	191 kw.-hr.	8.14
Refrigerator	605 kw.-hr.	19.55
Cooking and heating	26,015 kw.-hr.	307.22
Average per apartment:		
Light		$1.80
Elevator		.18
Refrigerator		.46
Cooking and heating		6.82
Unit total		$9.23

Summer bill, low month:

Light	2,027 kw.-hr.	$ 77.65
Elevator	194 kw.-hr.	8.26
Refrigerator	605 kw.-hr.	20.78
Cooking and heating	7,488 kw.-hr.	109.86
Average per apartment:		
Light		$1.75
Elevator		.18
Refrigerator		.46
Cooking and heating		2.43
Unit total		$4.80

Eighty-five per cent occupancy.

No. 3 Apartment Building. Electrical equipment—50 ranges, 198 space heaters, 325 kw. and 354 kw., respectively; 6½-hp. elevator, 3-hp. refrigeration and 3-hp. vacuum cleaner.

Cost of operation, Dec. 4, 1927, to Aug. 4, 1928:

	Kw.-Hr.	Yearly Total	Av. Per Month	Per Apt. Per Mo.
Total light	32,075	$ 969.23	$141.15	$2.42
Total power—elevator, refrigerator	90,000	288.97	36.12	.72
Cooking, heating	116,990	1,570.81	196.35	3.95
Total all electric energy		$2,829.01	$373.62	$7.07

Ranges Only

No. 4 Apartment Building. With 153 ranges, 855 kw., 57.5 hp. of elevators, 36 hp. of refrigeration equipment and 37 hp. of miscellaneous equipment.

Cost of operation, Dec. 1, 1927, to Aug. 4, 1928:

	Kw.-Hr.	Yearly Total	Av. Per Month	Per Apt. Per Mo.
Total light	60,790	$1,543.80	$192.97	$1.68
Total power—elevator, refrigerator	106,840	1,500.22	187.52	1.63
Cooking	50,140	759.83	94.98	.82
Total all electric energy		$3,803.85	$475.47	$4.13

Bathroom Heaters

No. 5 Apartment Building. Seventy-two 1-kw. bathroom heaters, two 10-hp. elevators, 5-hp. ventilating fan, 6.13-hp. refrigeration equipment.

Cost of operation, Oct. 1, 1927, to Aug. 1, 1928:

Total power	48,980 kw.-hr.	$957.81
Deducting power used for elevator, refrigerator and building use	31,200 kw.-hr.	734.50
Power used for bathroom heaters	17,780 kw.-hr.	$223.31
72 bathroom heaters, average, per month		$20.30
Average per heater, per month		.28

Number 1 building shows an average cost per occupied apartment of $6.36 per month for heating and cooking, and it is readily seen that the average rate per kw.-hr. is less than 1 cent. This building has a great deal of exposure, being tall and narrow with large window spaces, practically all outside rooms, and no surrounding buildings high enough to cut off the wind.

Number 2 building shows a winter bill (January, the highest month) amounting to only $6.82 for heating and cooking. The summer bill amounts to only $2.43 per apartment. This is during the period when the ordinary apartment house would provide no steam

at all, and yet these tenants have the convenience of turning on, in the cool mornings and evenings, all the heat they wish for. The cost for both heating and cooking is only slightly in excess of what would be the cost of gas for cooking.

The figures for number 3 building give the average for a period of eight months, these winter and spring months striking the same average as for the year. This shows a monthly cost of $3.95 per apartment for heating and cooking.

Number 4 building is one equipped with electric ranges. The average cost per range is shown to be 82 cents each per month over an eight-month period.

Number 5 building has installed bathroom heaters. The average cost is shown to be only 28 cents per heater for heat, as required, without stint.

Electric Lights *Attract Natural Food* for Trout Hatchery

ELECTRICITY at a Boulder, Colo., trout hatchery has been made to play an important part in feeding the young fish. Under the plan developed, a 60-watt bare lamp is suspended above each of the 18 x 65-ft. rearing ponds. Experiment proved that a height of not more than 4 in. above the water was the best for placement of the lights.

The young trout feed on insects, principally mosquitoes and moths, that are attracted to the lights in the dusk and early evening. The lights are kept on, however, from dusk to dawn, by means of a time clock. Throughout the night there is a constant jumping and splashing in the illuminated area of 20-ft. diameter beneath the lights. The total cost for lighting the four rearing ponds at the hatchery has averaged $5.65 per month.

It is estimated that the cost of feeding the trout is less by one-third than it was before the lighting installation. Feeding liberally on their natural food, the young trout grow faster and are much better prepared for life in the mountain streams than when the diet is nearly or wholly artificial. Less than an inch long when placed in the ponds in the spring, a high proportion of the fish are 7 in. long when transferred to the streams in the fall.

The plan of lighting the ponds was inaugurated by Mayor L. W. Cumberford, I. T. Vaniman and H. D. Tobey of the Boulder Fish and Game Club, aided by state officials. The installation was made by the Public Service Company of Colorado under the supervision of F. S. Henderson, district manager at Boulder.

Installation of 60-watt bare lamps at fish hatchery at Boulder, Colo., used to attract insects for feeding young trout in rearing ponds.

Night view of the Jantzen Knitting Mills, Portland, showing the floodlighted general offices at the left and a portion of the main factory at the right.

From 2 to 50 Foot-Candles Increase in Factory Lighting

By CHARLES PRYAL, SR.
Assistant Illuminating Engineer, Portland Electric Power Company.

"IF THE 'Jantzen Knit' is the suit that 'changed bathing to swimming,' then nothing shall be left undone to preserve the flawless perfection that has put the 'It' in the 'Jantzen Knit.'" So said the illumination engineer when he planned a complete revision of the lighting system in the factory of the Jantzen Knitting Mills, Portland, culminating in an increase in load for the Portland Electric Power Company of from 4 to 40 kw., and in increase in illumination for the Jantzen company of from an average of 2 foot-candles to intensities ranging from 20 to 50 foot-candles.

A FORWARD step in factory lighting was taken in changing over the Jantzen Knitting Mills, Portland, from low intensity, local lighting to high intensity, general lighting. The man who planned and executed the job here tells what was accomplished and how it was done.

The story of the growth of the Jantzen Knitting Mills is one of the romances of American business enterprises in which electricity has played an important part all along the line. From a production in 1917 of 600 suits the company worked up to a production of 950,000 suits in 1928, and has a schedule for 1929 calling for 1,056,000 suits. This volume represents 1/6 of the world's consumption of the product, about 20 per cent of the Jantzen production being exported.

Concentration on the one product, swimming suits, and the application of modern power driven machines, have helped increase the production per worker from 1,841 suits in 1923 to 3,765 in 1928, and now with the introduction of modern illumination the efficiency of the plant is expected to be increased beyond the 1928 figures.

The factory of the Jantzen mills occupies two city blocks in two one-story buildings having a combined floor area of 80,000 sq. ft. One building houses the general offices, stock rooms and the shipping department, the other comprises the main factory. Sandy Boulevard, a main artery of travel through the city, passes between the buildings, making it doubly important to maintain an attractive exterior, such as is illustrated in the general view of the office building with its flood-lighted facade. Varying throughout the year, between 500 and 750 workers, mostly women, are employed in the twenty separate operations going into the manufacture of a swimming suit, and the type of lighting formerly used was largely of the local or spot-light variety, with a small amount of comparatively weak general illumination. In some operations this spot-lighting was provided by means of a goose-neck fixture with a half-shade containing a 25-watt lamp for each individual machine or working space on the long tables, emitting a decided glare.

In planning the new illumination it was necessary to

Modern Industrial Lighting Applied to Portland Factory

THE EFFECT of changing over from low intensity, local lighting to high intensity, general lighting, is shown effectively by these photographs of the Jantzen Knitting Mills of Portland, Ore., taken before and after the completion of the lighting job. (1) and (2) show two general views of the factory, taken from the same point before and after the new installation. The change in conditions was effected by substituting 300-watt R.L.M. units on 7-ft. centers for scattered reflectors and 25-watt lamps in goose-neck fixtures. (3) and (4) are two views of the sewing machine room, where 50 foot-candles intensity was provided through using 300-watt units on 6-ft. centers. (5) is a view of the stock room where ample illumination is provided through the use of 75-watt lamps in Holophane units. The intensity in the factory was raised from 2 foot-candles to an average of 30 and in some instances 50 foot-candles.

study the twenty operations scientifically and make numerous tests to determine the illumination requirements of each, and then design the general illumination with proper fixtures and the necessary wattage at the proper spacings to meet the universal requirement. The result was the building up of a lighted floor area of 7 ft. and the creating of a flow of light in this area averaging 30 to 35 foot-candles on the average working surface 32 in. above the floor. This was accomplished by the use of 300-watt R. L. M. reflectors spaced about 7 ft. apart and mounted 8 ft. 2 in. from the floor to the lower tip of the reflector, equipped with bowl enameled lamps. Variations from this general scheme were that in some areas of the factory 200-watt R. L. M.'s were used while enclosing units were used in the general offices and over the shipping clerks' desks. In one department where 50 girls are employed at stitching machines for sewing on labels, 300-watt R. L. M.'s are spaced 6 ft. on centers, producing an even 50 foot-candles on the sewing machines. This room is believed to be the brightest lighted machine sewing room of any factory in the world. Narrow aisles between bins in the stock rooms were effectively lighted with 75-watt lamps in Holophane units, giving a surprisingly even intensity on the bins from floor to ceiling. A large number of Cheldon units were also installed.

The general plans for industrial illumination throughout called for about 250 300-watt and 100 200-watt R.L.M. reflectors, all equipped with bowl-enameled lamps. These were divided about equally between Benjamin and Westinghouse type. Some six thousand dollars' worth of antiquated "spot" light equipment was junked. The resulting effect, readily noted in the illustrations, is that of an even flow of soft, bright light of considerably higher intensity even than some of the so-called better factory lighting installations of comparatively modern design. Both the absence of glare and the complete elimination of shadows is apparent. Though no direct light is wasted on the ceiling it will be noted that a counter reflection reaches it, thus removing the last vestige of gloom that obtained under the former system. The total connected load is about 250 kw. for the illumination of the two buildings.

The process of making this radical change-over in the lighting of the Jantzen plant, representing as it does a step or two beyond the customary practice in factory lighting, was by no means a simple performance. The co-operation of the plant manager, who was willing to go to considerable lengths to improve working conditions for the employees in the hope of securing returns in increased efficiency, eye-comfort, less accidents and a more uniformly perfect product, was not altogether of sufficient urge to swing the business. The new idea had to be sold to the workers, and anyone who has had occasion to attempt to put over a radical idea affecting the bread-and-butter occupation of a group of women, even though they be of the same high grade of intelligence as are the Jantzen workers, will recognize the difficulty encountered. Many weeks were spent in demonstrations and class work to educate the employees in different departments of the factory to the improvement in conditions that the general lighting system would bring them in comparison with the old local or spot-lighting system to which they were accustomed. Now, that the installation has been in operation a few months, however, it is characteristic of such situations to note that all the workers are enthusiastic boosters for the new type of lighting, and not one could be persuaded to go back to the old system.

View of the shipping department lighted with 200-watt units on 7-ft. centers. Over the desks of the shipping clerks 200-watt enclosing units are used.

It is too soon yet to secure data that might indicate some of the dollar-and-cent returns secured by the Jantzen company, but it is quite evident that the benefit to the eyes of the workers, with its attendant psychological and physiological effects, will reflect a higher over-all plant efficiency through the bettering of the morale of the operatives.

A general view of the factory interior showing the intensity obtained with the new lighting installation.

Benefits Obtained by Dairy Electrification
30-Cow Dairy

Equipment	Installation Cost Complete	Interest and Depreciation at 20 Per Cent	Annual Kw.-Hr.	Annual Cost	Total Cost, Interest, Depreciation and Power	Saving in Labor and Expense	Increased Value of Milk	Net After Deducting Cost of Operating Equipment
Lights	$ 150.00	$ 30.00	360	$ 7.20	$ 37.20	$ 60.00	.....	$ 22.80
Water for cleaning and drinking	150.00	30.00	648	12.96	42.96	120.00	91.14	168.18
Sterilizer	100.00	20.00	2,160	43.20	63.20	.....	516.46	453.26
Milking machine	450.00	90.00	900	18.00	108.00	600.00	.....	492.00
Refrigerating plant	1,500.00	300.00	6,500	130.00	430.00	.....	607.60	177.60
Feed grinder	350.00	70.00	720	14.40	84.40	300.00	.....	215.60
Total electrical equipment	$2,700.00	$540.00	11,288	$ 225.76	$ 765.76	$1,080.00	$1,215.20	$1,529.44
Building improvements	1,500.00	300.00	.....	.....	300.00	.....	607.60	307.60
Total	$4,200.00	$840.00	11,288	$ 225.76	$1,065.76	$1,080.00	$1,822.80	$1,837.04
Unit per cow	$ 140.00	$ 28.00	375	$ 7.52	$ 35.52	$ 36.00	$ 60.76	$ 61.24

Electric power figured at 2 cents per kw.-hr.
This estimate assumes a saving in labor of $780 per year by the use of electricity for lights, pumping water and operating a milking machine. These figures are conservative. It also assumes a reduction of 10 per cent in the amount of feed required on account of grinding. The increase in value of milk is obtained by raising the standing from factory milk at 60 cents per pound butterfat to grade A market milk at 81.7 cents per pound butterfat. There is an increasing demand for grade A market milk. This quality of milk can be produced more economically by the use of electrical dairy equipment.

Net Profit *Per Cow*

With Dairy Electrification

PROFIT to farmer and to central station is to be found in complete electrification of dairy equipment. Central station executives may always have felt this to be true. Farmers may have doubted it or hoped blindly that it might be true. But until cost studies could be made and comparisons drawn, based on reliable experience, the matter would never be more than speculation.

As a company deeply concerned with the status of agriculture in its territory because its basic load is largely agricultural, the San Joaquin Light & Power Company really wanted to know. If salesmen were to sell dairy electrification they must know what it would do for the customer. If farmers were to buy it they must be convinced that it would result profitably to them.

E. G. Stahl, agricultural power specialist for the commercial department, was set to work upon the task of ascertaining as nearly as possible the facts. The accompanying table is the result.

So good a case does this table make for electrification that every figure was gone over carefully several times. Because every base estimate was made quite conservatively no revision produced anything but even better results. Then the table was sent to Ben D. Moses, executive secretary of the Committee on the Relation of Electricity to Agriculture, at the University Farm, Davis, Calif.

Here again, because the case for electricity looked too good to be true, every figure wes rechecked. Professor Moses came to the conclusion that since it was based almost entirely upon his committee's actual test records, it was thoroughly reliable.

With this assurance it was released to the salesmen of the company to assist them in selling the electrification that would result in improved dairy products, better price for better grade milk, hence profit to dairyman and to central station also.

The production, according to this table, assumes healthy cows of good production capabilities. It assumes cows capable of producing 280 lb. of butterfat per year, which is moderate. Many cows produce 300 lb. and better. The average for the state is 265 lb.

The current consumption figures are quite conservative. They are based on Davis experimental farm tests and the experience of the power company itself.

Savings in labor cost given in the table are likewise conservative. Only on the feed grinding is there any difference of opinion as to the value in labor saved by

Definition
of a Power Company Salesman

¶ A power company salesman is a man who sells a satisfactory amount of electrical service to individuals after convincing them that the service will pay them a profitable return—

E. G. Stahl
San Joaquin Light & Power Corporation

electrification. In some cases it is estimated that 30 per cent is saved; in others none.

In all other cases the data are substantiated by figures from various parts of the state enumerated in the Agricultural Power Handbook of the P. C. E. A., just issued.

Attention is called to the one load, refrigeration. This load provides the best load factor and best annual revenue of any item in dairy electrification.

The better price for milk of Grade A standard is an established fact. Moreover, inspection of milk is becoming more rigid. Requirements are stricter. Also the market for Grade A milk is improving and the increasing demand for milk of this quality assures the dairyman of a profitable market for his product.

Dairy electrification, then, offers possibilities of development among two classes of dairy farmers:

To the man now producing Grade A market milk electrification offers a means to keep his product up to standard in the face of increasingly strict requirements.

To the man now producing factory milk at low price it offers the possibility of improving the grade of his product so that he may sell it at the better price which Grade A market milk brings.

And to the cantral station which sells "a satisfactory amount of electrical service" in dairy electrification to an individual to whom this service pays "a profitable return," it means $7.52 per cow, per year.

Modern Floodlighting of Public Buildings

By W. M. CALLAHAN

Electrical Engineer, Division of Architecture, California State Department of Public Works, Sacramento.

Architectural beauty of State Capitol Building enhanced by installation costing only $6,845. Daily operating cost, including energy, upkeep, depreciation and interest, only $7.44.

MODERN floodlighting is assuming increasing importance in the commercial field as well as contributing toward a wider appreciation of the beauty and architectural design of public buildings and civic centers.

From a utilitarian standpoint, floodlighting has materially increased production in industrial plants by virtue of the fact that more efficient working conditions are afforded through an equally distributed intensity of illumination. The installation of floodlights to illuminate an extremely large area permits the mounting of the units at concentrated points, quite often isolated, thereby eliminating the obstructions caused by poles or standards, which are necessary in the case of direct unit lighting. In this particular class of service there is the lighting of railroad yards, wharves and docks, building construction, grading and excavating projects, carnivals and expositions, athletic fields, airports, and many other applications too numerous to mention.

The artistic application of floodlighting presents an unlimited field for the illuminating engineer. By a comprehensive study of the architecture, together with a correct design based on the fundamental principles of floodlighting, the conception of the architect can be lifted from nightly obscurity and beautifully portrayed on a dark background.

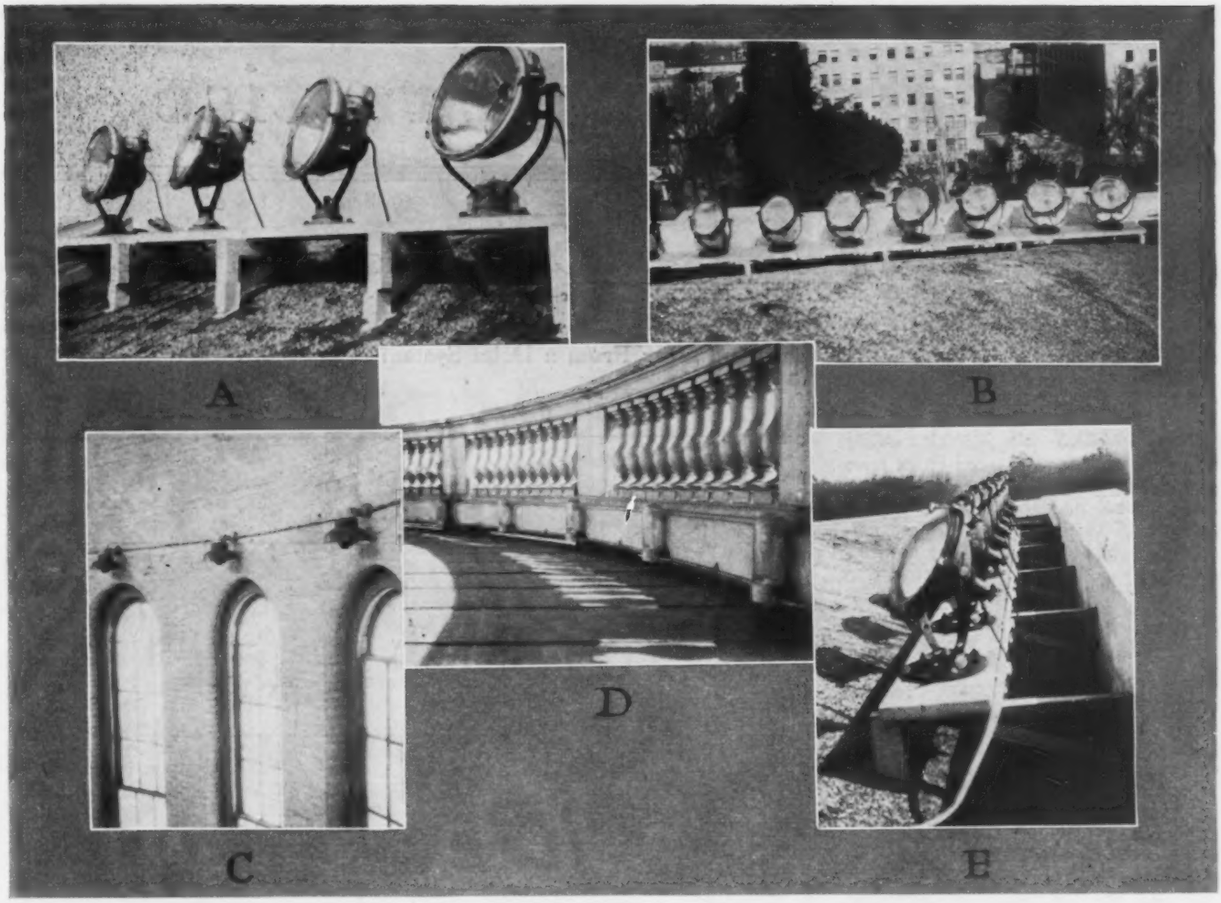
Unfortunately, at times, the error of too brilliant or too intense illumination is discernible. The shadows which tend to emphasize the mass and proportions of the structures are obliterated and at the same time shadows which are distasteful are accentuated by intense illumination. Attainment of the desired results often necessitates a wide deviation from the so-called hard and fast rules of the technical engineer.

Photo by Gropp.
Floodlighting of State Capitol Building, Sacramento, Calif.

National, state and city governments are constantly authorizing the floodlighting of their respective civic structures. These edifices all possess architectural detail of exquisite beauty and are the manifestation of political and community prestige.

Keeping abreast of the national trend, the State of California has completed the floodlighting of the upper portion of the Capitol Building at Sacramento. This particular job was rather difficult in that only three sides were available for the installation of floodlighting equipment; however, after careful study, the locating of the equipment at the correct angles enabled the engineer to obtain results which have proved satisfactory.

Main floodlighting of the dome is provided from banks of 22 General Electric type L-24 1,000-watt projectors and 28 General Electric type L-9 500-watt pro-

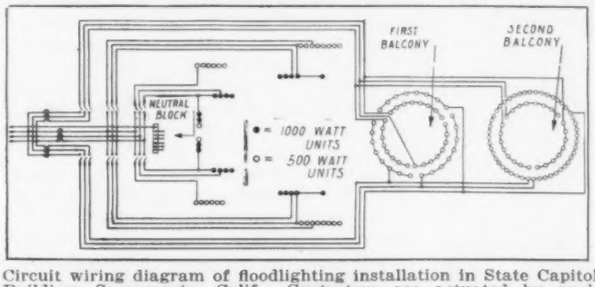


Details of Capitol Building floodlighting installation. (A)—Battery of 1,000-watt projectors on roof. (B)—Bank of 500-watt projectors. (C)—Two hundred-watt lamps in ruby globes and reflectors are mounted inside the dome over each window. (D)—Relief lighting for balconies is provided by 200-watt lamps in vapor-proof fittings. (E)—Projectors mounted in platforms showing conduit connections.

jectors mounted on low platforms around the edge of the main roof of the Capitol Building. Since these projectors are adjustable it is possible to secure proper lighting effects with comparative ease.

To relieve the sharp shadows caused by the two balcony railings around the dome, a series of relief lights is employed. There are mounted on the inside of the upper balcony railing 48 200-watt type C lamps enclosed in Crouse-Hinds vapor-proof fittings. Twenty-four of the same type of lamps and fittings are installed around the inside of the lower balcony. Not only do these lamps eliminate the shadows on the dome caused by the floodlights and railings but they also raise the railings in relief to provide a most pleasing effect.

An architectural feature of the dome is the two rows of long narrow windows separated by thin columns that surround the dome at two different elevations. A striking color effect is provided by mounting 24 200-watt type C lamps in Crouse-Hinds vapor-proof fittings with ruby globes on the inside of the dome, one over each window. These lamps are not lighted when the general floodlighting is on, but are used on special occasions to provide a red silhouette effect.



Circuit wiring diagram of floodlighting installation in State Capitol Building, Sacramento, Calif. Contactors are actuated by push buttons in basement.

To assist the floodlighting to overcome the lost reflection due to the extremely dark weathered copper surface of the dome, 1,200 10-watt lamps are mounted on the ribs of the dome and around the edge of the smaller dome capping the entire structure.

The installation represents a total connected load of 62.4 kw. It is arranged on a three-phase, four-wire system as shown on the accompanying circuit diagram. It is controlled by Diamond H contactors with push-button stations located in the basement.

The cost of the entire installation was $6,845.

The system is in operation every night of the year from 8 to 11 o'clock in the evening. The operating cost per day is as follows:

Current	$5.38
Lamp renewals and depreciation	0.75
Interest on investment	1.31
Total daily cost	$7.44

The original design, plans and specifications were prepared by the electrical section of the division of architecture of the State Department of Public Works. The installation was executed under contract by the Latourette-Fical Company of Sacramento.

Engineering Practice

A General Purpose A.C. Secondary Network

A Discussion of the Operating Practice and Experiences of an Eastern Utility in Changing Over From a Delta System

By A. V. Simpson

PRACTICALLY all electric utility companies serving large cities have agreed that the a.c. secondary network is the most dependable type of electric distribution system for major residential and business districts. Since the network system and its engineering and construction problems still are in the development stage, it is the purpose of this article to outline certain practices and procedure of an Eastern company with regard to this type of underground construction.

Specifications as outlined are not offered as arbitrary standards, but rather as typical operating practice of the company in question and based upon that company's experience. At present the company has five rather extensive networks in operation and in addition to these, several large theater installations and smaller networks consisting or two or more transformer installations. Large new buildings adjacent to the main networks are being tied in and other services in these areas also are being cut over to the main networks. All of the networks installed are 115-200-volt, four-wire Y, serving combined light and power loads.

A typical network fed from two 2.3/4-kv. Y feeders with a lateral feed from a third circuit, all feeders originating from one substation, is shown in Fig. 1. This particular section of the system originally was underground and consisted of single-phase lighting and delta power. In changing over, all existing equipment that could be fitted in with the new scheme was used and at the same time necessary new equipment was purchased and existing transformer rooms were enlarged.

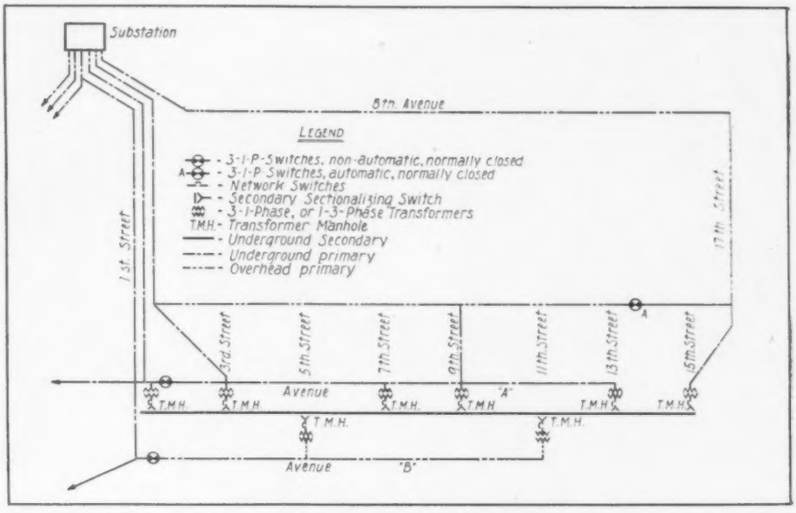


Fig. 2. A preferred network system, fed from three primary circuits.

Underground primary cables in the main feeder loops consist of three 200,000-circ.mil, single-conductor, 4-kv., lead-covered cables, with a 2/0 lead-covered, 600-volt cable serving as a neutral conductor. Primary lateral feeds in the network area are either 200,000-circ.mil or 2/0 single-conductor, 4-kv., lead-covered cables underground, with overhead primaries consisting of three 2/0 conductors, and one No. 2 neutral, all of weatherproof wire. The company's general practice is to use 250,000-circ.mil cables, but in some locations 200,000-circ.mil and even 2/0 cables have been retained in service where such already existed. Primary leads to transformer rooms and manholes are comprised of four No. 2 lead-covered cables.

It so happens that in the area shown in Fig. 1, one set of automatic primary switches is mounted on a pole and the second set is mounted in a transformer room. The object of these automatic switches is to operate in case of a primary fault, thus splitting the system and permitting service to be restored immediately to at least half of the customers on that section. This particular operating scheme is necessitated by the fact that the major feeder circuits supply loads other than the network loads. In Fig. 1, two sets of non-automatic sectionalizing switches are shown at Avenue "A." These serve as sectionalizing switches to reduce to a minimum the number of transformer banks on Avenue "A" that may be put out of service because of any one primary fault. These same switches serve also another purpose as indicated on the westerly (left) end of the network, where their use makes possible a duplicate feeder service to important cus-

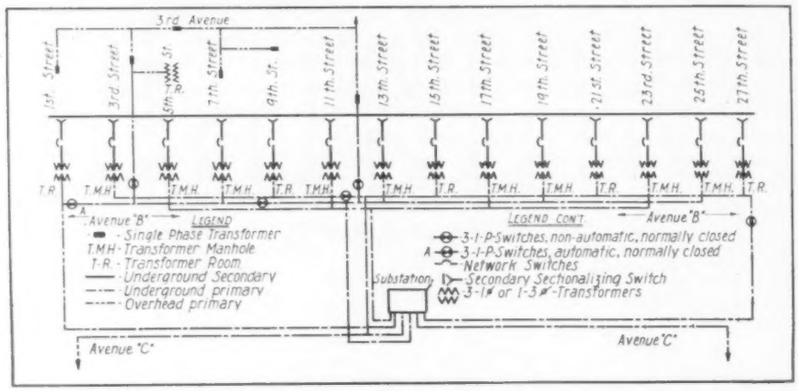


Fig. 1. A typical network fed from two 2.3/4-kv. Y feeders with a lateral feed from a third circuit, all from the same substation.

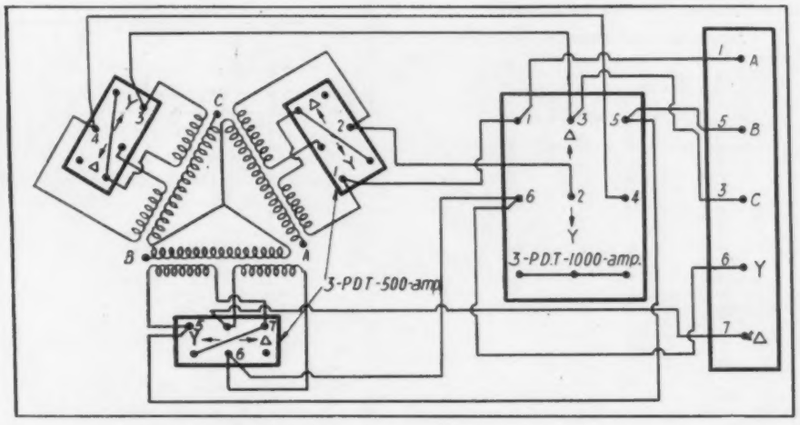


Fig. 3. Connection scheme for portable transformer equipment.

tomers not in the network area, but fed from the same primary feeder as that feeding the network.

Considerable discussion as to whether or not a disconnecting device should be installed on the primary side of the transformer bank finally resulted in the selection of potheads in transformer rooms with oil cutouts fused solid in transformer manholes. The company deems it advisable to "kill" the transformers for network switch testing and adjustment since it is impossible to take the feeder itself out of service. At a future date when all of the load on a particular feeder shall have been arranged to be network load, it is planned to remove the oil cutouts, but the potheads will remain as a means of connection between lead-covered and flame-proofed cables.

Transformer Location and Arrangement

Because of the large load in and adjacent to a large theater, it often becomes necessary to install two separate transformer banks, feeders and switches in one location. In these instances a transformer room is constructed with a dividing wall built between the two banks of transformers and with the switches placed in still another compartment completely isolated from the transformers. Thus, in case of a transformer explosion or fire the trouble is limited to one bank and its related feeder and switching equipment, the remaining bank being permitted to pick up and carry the load without interruption.

Three 50-kva. and three 100-kva., single-phase transformers are used at present in transformer manholes. Three 50-kva. and three 100-kva., single-phase transformers and 150-kva., three-phase transformers are used in the transformer room. All transformers at present connected to the 4.-kv. primary are of normal reactance and have given satisfactory operation. However, it is expected that when 13.2-kv. primary feeders are used transformers of higher reactance probably will be required, to permit them to be tied in to the same network now fed from 4-kv. transformers and feeders. Because of the smaller space requirement, lower costs and higher efficiency, the trend is toward the use of 150-kva. and 300-kva., three-phase transformer units.

At present both 500-amp. and 800-amp. network switches are used, and it is established practice to fuse these switches at twice normal current rating, 1,000 amp. and 1,500 amp., respectively. Relays are adjusted to reclose these

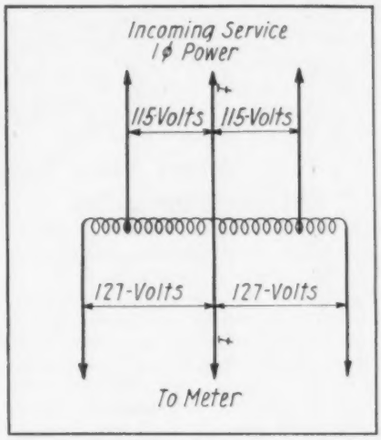


Fig. 4. An auto-transformer connection for single-phase emergency service.

switches upon an excess potential of 2 volts occurring in the secondary.

When a 300-kva. bank is installed in a transformer manhole the company's practice is to use three 250,000-circ.mil, lead-covered, 600-volt secondary cables per phase, and two 2/0 lead-covered neutral conductors, all extending from the switch to the first manhole in the street. When a transformer of this same capacity is installed in a transformer room within a building, the load of which constitutes an appreciable portion of the total transformer load, only two 250,000-circ.mil cables per phase and two 2/0 neutral conductors are installed, since in this case only part of the transformer current is fed back into the street. In the case of a 150-kva. bank, either in a transformer room or a transformer manhole, two 250,000-circ.mil cables and two 2/0 neutral conductors are used. In duct arrangement these cable groups are divided among three ducts, each of the two ducts carrying a three-phase cable group and the third duct carrying the neutral conductors. These ducts are separated as much as possible to facilitate heat radiation. All cables terminate in secondary sectionalizing switches in the first manhole in the street.

Secondary cables in the street are 250,000-circ.mil, 600-volt, lead-covered cables for phase conductors and 2/0 neutral conductors, two cables per phase and two for the neutrals. Here again the cables are divided into two separate phase groups and neutrals. Thus with a single, three-phase set of cables in a given duct and separated from the other three-phase sets and from the neutrals, failure in any one cable will involve only one set of cables during the period that a secondary fault is being burned clear.

In Fig. 2 is shown a type of network fed from three primary feeders, a scheme preferable to that shown in Fig. 1. As may be noted, only one primary is carried in a given subway (except for short distances), the remaining two feeders being brought to the network in the form of primary taps from feeders on parallel streets adjacent to the streets to be networked. This is done to obviate the possibility of all cables in a manhole being damaged by an explosion. This type of primary supply now is established company practice where field and economic conditions permit.

Portable Transformer Banks

Portable transformer banks that may be moved from location to location as construction work progresses are of great service during network cut-over. A trailer equipped with three 100-kva. single-phase transformers connected as shown in Fig. 3 gives a most flexible outfit. Primary cables enter the trailer through the roof, pass through 100-amp. primary cutouts and then to the transformers. A pothead is installed in the primary neutral so that the neutral may be opened for the closed delta connection and closed for the Y connection. Simply by throwing three two-

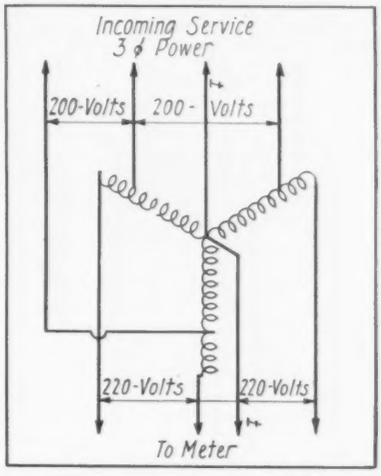


Fig. 5. An auto-transformer connection for three-phase emergency service.

TABLE 1—Steps Taken to Make Customer Equipment Operate on Network

Equipment	Adjustment for 200-Volt Operation
Elevator-starting equipment. All automatic-control, 220-volt, three-phase.	Adjustment of starting relays for lower voltage operation. Auto-transformers used temporarily.
X-ray machines, 220-volt, single-phase.	Reconnect auto-transformer in X-ray.
Magnetic brakes, printing presses, 220-volt, single-phase.	Reconnect for 115 volts or lower voltage taps.
Linotype melting apparatus, 220-volt, single-phase.	Replace heating coil with 115-volt coil or bring out mid-point and ground it. Use time switch to turn pots on.
Arc lamps, blueprint machines, 220-volt, single-phase.	Lower resistance or reactance taps on compensators.
Electric shoe, blueprint driers, mangles, 220-volt, single-phase.	Reconnect or replace heating units for 200-volt operation or bring out mid-points to ground.
Electric ovens, bakeries, 220-volt, three-phase.	Replace coils with 200-volt voils. Install three auto-transformers.
Doughnut machines, 220-volt, single-phase.	Bring out mid-point of coil to ground or reconnect for 115 volts.
Process engraving driers, 220-volt, single-phase.	Reduce number of turns in coils. Bring out mid-point to ground.
Oil filters, 220-volt, single-phase.	Rewind for 200-volt operation. Use auto-transformers.
One or two forms of automatic refrigeration control, 220-volt, three-phase.	Adjust starting relay for a lower voltage pick-up value.
Old type motors with minimum voltage rating of 104 to 208 volts.	Auto-transformers.

Auto-transformers connected as shown in Figs. 4 and 5 may be used permanently or temporarily in all of the cases listed in Table I.

pole and one three-pole double-throw switches, either a delta or a Y connection can be made. Conductors of 800,000-circ.mil cable connect transformers to switches and switches to terminal board where the network cables which enter the trailer through the floor may be shifted quickly either to the delta or to the Y connection. A color scheme is used to mark the delta and Y connections in order to prevent the operator from making a false connection.

All meters were checked and three-wire 220-volt meters which record incorrectly on the Y-voltage were replaced with either two-wire 115-volt meters or three-wire two-element meters. The two-element meters also record correctly on the delta. During inspection prior to cut-over a check is made of the customer's equipment to determine which, if any, equipment would not give satisfactory operation on the lower network voltage. If the equipment cannot be altered before being cut over to the network, plans are issued to install auto-transformers and to cut them in during the cut-over.

Troubles

Equipment that has failed to function properly on a 115-200-volt Y net work and the steps taken to rectify these conditions are outlined in Table 1.

Special 115-127-volt auto-transformers in 5-kva. and 15-kva. sizes are kept in stock to meet emergency low-voltage complaints. These transformers can be installed within 24 hours from the time a notification of low voltage is received. On a 200-volt single-phase installation where the neutral is available two auto-transformers may be employed as shown in Fig. 4. Three-phase power voltage is boosted as shown in Fig. 5.

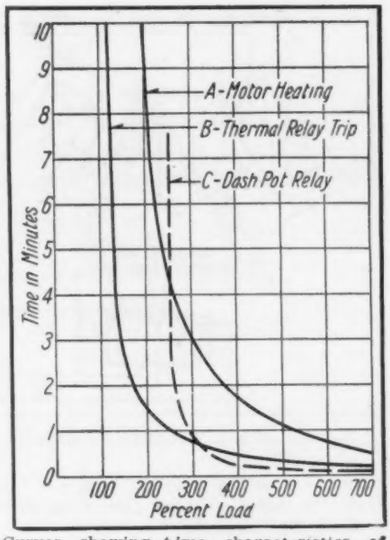
It is imperative that service to all customers be maintained during a cut-over period. Therefore special precautions are taken to see that service is not interrupted and this is facilitated by using the trailer and by cutting over one room at a time. This scheme of cut-over has been carried on throughout the entire job and it has been found to function in a most satisfactory manner.

Thermal Relays Give Best Motor Protection

Thermal relays for overload protection of electric motors have many characteristics to recommend their use in place of the obsolete and unsatisfactory dash-pot relays or straight solenoid trips so often used for this purpose. The thermal device follows the heating curve of the motor, assuring protection to the motor, but not shutting it down instantly in cases of high but harmless over-current demands.

Motor temperature and not instantaneous ammeter readings is the criterion of possible motor damage, and motor temperature depends upon the length of time the current flows as well as upon the amount of current. Naturally, then, if either factor is small the other can increase safely without increasing machine temperature. In other words momentary overloads are well within the thermal capacity provided by the mass of iron and copper in the motor. Continued high current, even a relatively small overload, is a different matter, however.

True overload motor protection is given only by a device the operating characteristics of which follow the heating curve of the motor itself. The ordinary selenoid type of over-current relay acts instantaneously except as impeded by the action of the dash-pot usually a part of the relay. Not only is the calibration of such a device extremely unstable but the range is equally limited. For instance, it is necessary to bypass this type of protective relay during across-the-line starting periods even though the high starting current may flow but 10 sec. or less.

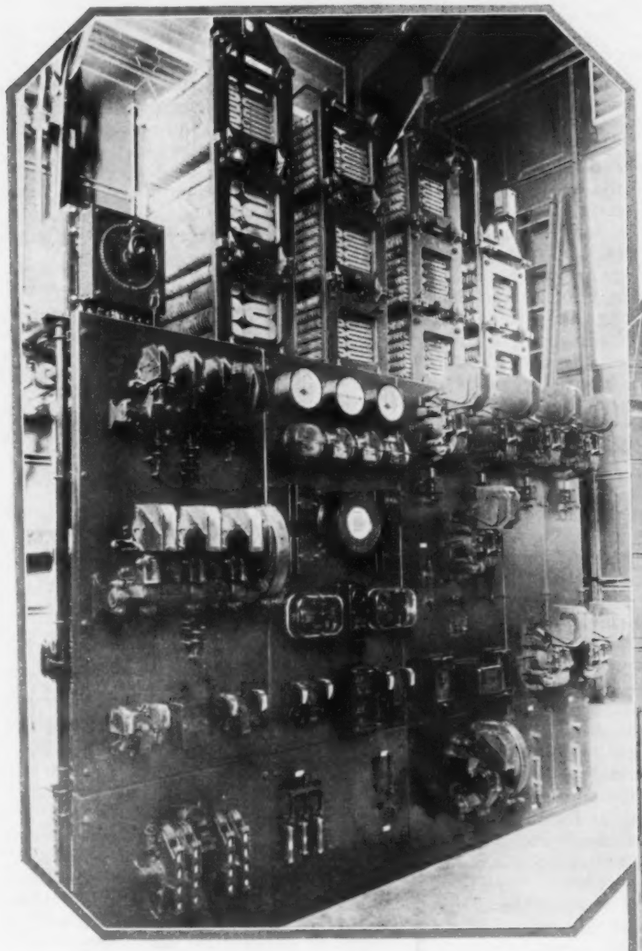


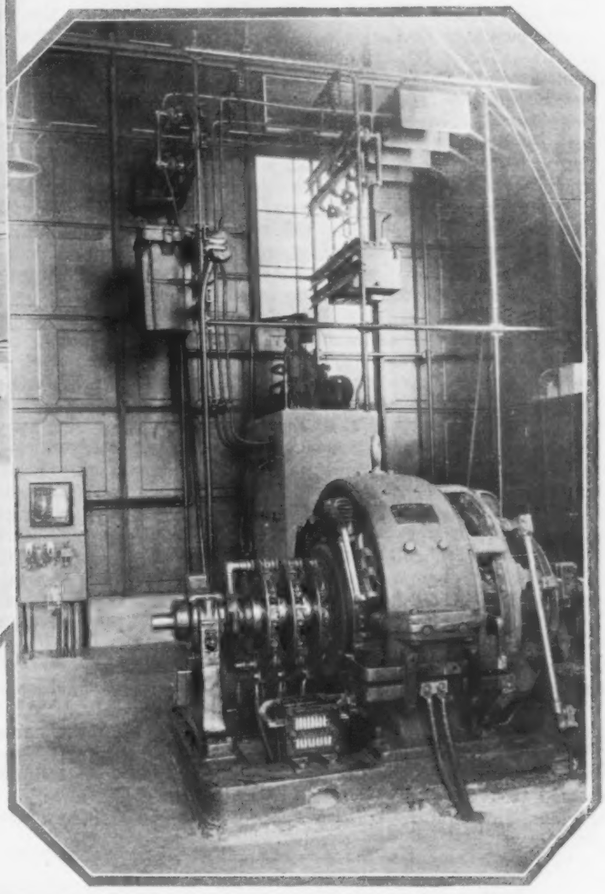
Curves showing time characteristics of motor heating, thermal relay action and solenoid relay action.

As indicated in the accompanying illustration, the inherent characteristics of the thermal relay produce an operating curve similar to the motor heating curve and obviate the faults of an artificially delayed magnetic action. For example, with the dash-pot type of relay set to trip at 250 per cent of normal motor current no protection at all is given for sustained overloads under this value. The dash-pot would permit a continuous 200 per cent overload on the motor whereas the thermal relay would remove the motor from service at the end of about 12 min. However, if the dash-pot relay is adjusted to protect the motor from these lower overloads it will act instantaneously at high overcurrent, resulting in unnecessary interruption to service. The thermal relay avoids these unhappy compromises and delays its action automatically, according to the current flowing.

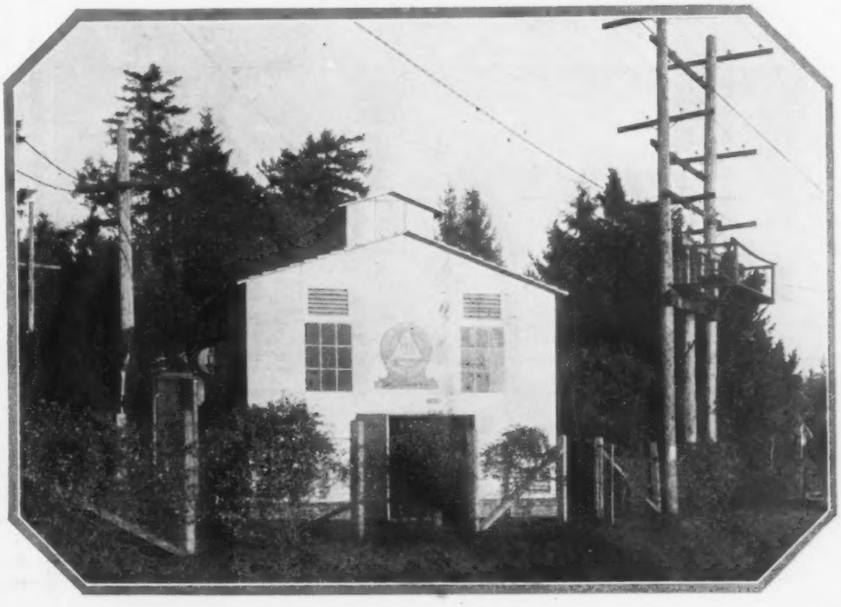
B.C. Electrolytic Plant Served by 18,000-Kw. Mercury Rectifier — The Consolidated Mining & Smelting Company (British Columbia) has acquired what is claimed to be one of the largest consignments of mercury-vapor rectifying equipment so far delivered on this continent and the first to be installed for electrolytic processes. The equipment comprises three Brown-Boveri rectifier units, each having a capacity of from 10,000 to 12,000 amp. at 500 volts. The power supply for these rectifiers will be taken from a 60-kv. line at Trail, B.C., through a 66-kv., 1,000,000-kva. oil circuit breaker and a 66/13-kv. bank of single-phase transformers which feeds directly the three individual 5,000-kva., three-phase transformers. Each of these latter feeds two 5,000- to 6,000-amp. rectifier cylinders which will operate in parallel. The cost of the installation will be in excess of $500,000.

Rupert Automatic Substation





IN AND around Portland the Portland Electric Power Company serves the district not only with power and light, but also provides important interurban electric railway service. The three accompanying illustrations show one of the company's several railway substations about half-way between Portland and Oregon City. Immediately above appears the switchboard with the machine resistors mounted above it. The next view shows the 600-volt, 833-amp., 1,200-r.p.m. rotary converter and also, to the rear of the converter, part of the bus and switching equipment, including the main oil circuit breaker. As may be noted in the lower view of the station, the main power transformer bank is located outside of the substation building. This transformer bank has a normal capacity of 500 kva. and a two-hour overload rating of 750 kva. The main power supply for the station is an 11-kv. line and the voltage to the converter 444, with 148 volts available for starting purposes through special starting taps. The building is a Truscon steel construction. Installation was completed in June, 1924, and equipment has been in operation since that date.



Reverse Registry in Electric Meters--II

A Further Discussion of the Effect of Ground Currents Upon Meter Registration and How to Overcome the Difficulties

By E. C. GOODALE, Tacoma, Washington

UNDER several conditions of incorrect connection a single-phase watthour meter may register its own load correctly, but may be caused to register backward due to load or ground conditions elsewhere on the same secondary circuit. These conditions may never come to light until several years after the installation of the meter, but inevitably will show up under certain circuit conditions if the meter is incorrectly installed and connected. In a previous article it was shown that when the "hot" wire of the secondary service is connected (wrongly) to the "bar" (inside) line terminal of a single-phase, two-wire watthour meter, external loads served from the same leg of the transformer may cause a backward registration on the meter and external loads served from the opposite transformer leg may cause forward registration on the meter, even though the load current causing the disturbance is itself metered through a different and independent meter at a distant point. It was pointed out in that article that if the neutral wire of the distribution circuit (between this meter and the transformer feeding it) be a relatively poor conductor such as might be caused by poor joints, and if the load wire coming from the meter's current coil (outer terminal) is grounded at some point on the load side of the meter, incorrect registration is inevitable.

This present article and the one mentioned above were inspired by records of similar instances wherein trouble men have investigated meters which seemed to register sometimes forward and sometimes backward without apparent provocation. As described in the preceding article the remedy for this erratic registration is to interchange the two line wires and perhaps also interchange the two load wires, at the meter. Returning ground currents from outside loads then cannot back feed or return through the neutral wire and current coil of the meter in question. Also the interchange of the load wires assures that internal grounds (if any) will be kept on the neutral conductor so that the meter will not register and the trouble cannot blow a fuse.

A very similar case and one which may be remedied in the same manner results when the meter is wrongly connected as before and there is an external ground ("external" meaning on the line side of the meter) instead of an external load. Figs. 3 and 4 illustrate this. The neutral conductor between transformer and meter in this case may be a very good conductor, in fact the better it is the more leakage current will pass through the meter from the external ground. Such a condition often is caused by tree grounds on the outside service. Tree grounds also may cause the internal ground ("internal" meaning on the load side of the meter), as for example in rural districts where a number of buildings are fed from a single service.

With an external ground the action is just the reverse of that caused by an external load. If an external ground occurs on the same leg as the meter the meter will register forward, while if on the opposite leg the registration will be backward.

The amount of total ground current which will pass through the meter of course will be inversely proportional to the impedance of the path from the point where the external ground occurs, through the earth to the internal ground point and back through the meter coil, as compared with the impedance of the direct route from the external ground to the transformer neutral ground. If the transformer ground be poor and the neutral wire and load-side ground be good a relatively large amount of current will pass through the meter.

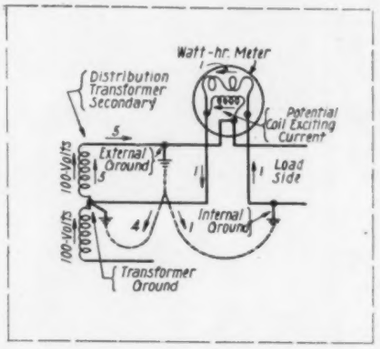


Fig. 3. Ground currents cause a 100-watt erroneous forward registration on meter due to (1) interchanged line wires, (2) external ground on the "hot" wire of the metered circuit and (3) internal ground on the neutral wire.

In the usual case incorrect registration from such wrong connection is caused by accidental grounds. A meter so connected, however, is at the mercy of the dishonest customer who may install his own ground and make the meter "do tricks" without exposing himself to liability for tampering.

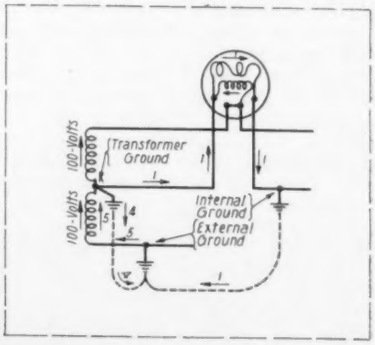
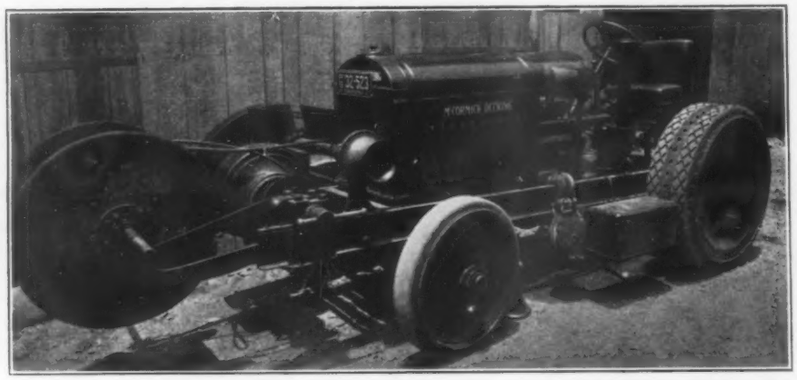


Fig. 4. Erroneous backward registration of 100 watts caused by ground currents due to (1) interchanged line wires, (2) external ground on unmetered circuit and (3) internal ground on neutral wire.

Suppose there is no other load on the transformer and no ground on either "hot" conductor. Still a meter connected with the grounded service wire in the current coil terminal will give incorrect registration if there is an internal ground on the load wire coming from the current terminal. The registration always will be lower than it should be and may even be backward. This will result when the resistance of the ground path from the transformer neutral to the point of internal ground

Portable Cable Puller



A portable tractor-mounted cable puller developed according to design specifications of the transportation department of the Los Angeles Gas and Electric Corporation. This apparatus is capable of pulling electric cables into underground ducts from manhole to manhole up to distances of 300 ft., a job formerly requiring the services of four men operating a hand winch. The cost of the equipment shown was about $2,000.

is very low and the load is highly inductive and the meter is not far from the transformer.

Under these conditions the load current will divide, vectorially, into two parts. The part flowing through the ground will lead the total current while that flowing through the relatively high inductance of the meter's current coil will lag the total current. If the load current itself is highly inductive the 90 deg. lagging the line voltage and hence will give a negative registration on the meter.

Fig. 7 illustrates the effect of an internal ground on the registration of such a wrongly-connected meter when there is a highly inductive load.

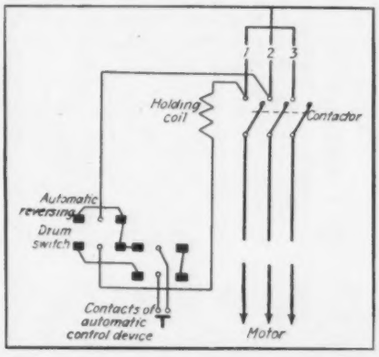
EDITOR'S NOTE: This discusison of meter reversal will be concluded in a subsequent issue of ELECTRICAL WEST.

Motor Controls Transferred by Drum-Type Switch

A simple and comparatively inexpensive scheme for transferring motor controls from hand to automatic operation is indicated in the accompanying illustration. This scheme is in use at the Chelan hydro plant of The Washington Water Power Company where there are five pumps controlled by either automatic devices or by hand. All of the driving motors are started directly across the line by means of push-button controlled, solenoid-operated contactors. A drum-type reversing switch of standard manufacture and suitable for small motors on circuits up to and including 600 volts is inserted as shown in the circuit of the contactor holding coil. The cost of this reversing switch is about the same as a push-button station that would perform a similar function on a 440-volt circuit. The switch contacts are rugged and have sufficient carrying capacity for any contactor coil circuits that might be used.

When the reversing switch is in the position indicated in the accompanying illustration it is in the "off" position which leaves the control circuit open and the motor circuit also open. When the drum switch is thrown to one side the contactor coil circuit is placed in series with the contacts of the float switch or other automatic device which may be used to control the operation of the motor in question and the motor thus is made subject to the control of that device. When the drum switch is thrown in the opposite direction the contactor or control circuit is closed and the motor will run independently of the position of the contacts in the automatic control device. In the case of small-sized d.c. motors the main motor leads may be controlled directly by the drum switch, of course, without the insertion of the contactor. The drum-type reversing switch itself is so small that it may be mounted at any convenient point. When mounted directly on the motor frame as at Chelan the arrangement affords a unit construction.

By carefully marking the positions of the drum type control switch "run," "off" and "automatic" the operation of the switch is self-evident whereas push-button stations used for the same service would not permit as simple or as reliable operation. In the case of a 440-volt motor circuit a small drum-type reversing switch costs only half as much as the two push-button control stations that would have been required



Schematic diagram of circuit for swinging a motor from manual to automatic control.

to perform the same function. In addition, no tampering with the automatic control device is necessary in case it is desired to operate the motor irrespective of the position of the control device.

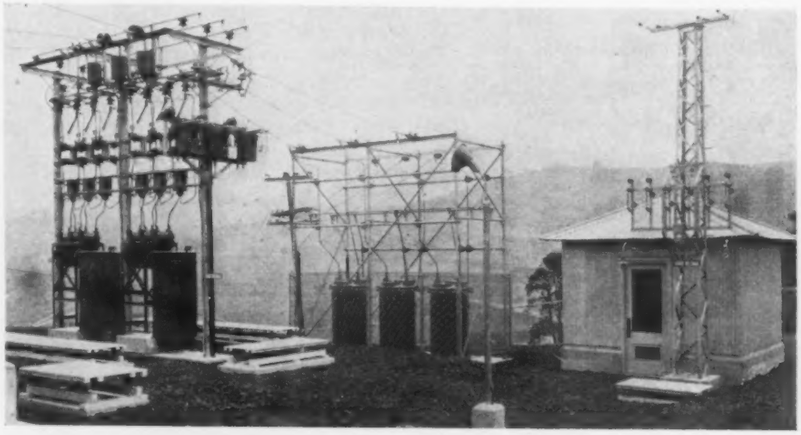
The arrangement described in the foregoing paragraphs may be used to advantage in transferring motor control from automatic to hand control in the case of pumps, blowers and other machinery normally controlled by automatic devices such as float switches, pressure switches, temperature switches and other similar devices. It permits the motor to be operated according to the demand of existing conditions and according to the desire of the operator.

Metallic Glaze Insulator Reduces "Static"

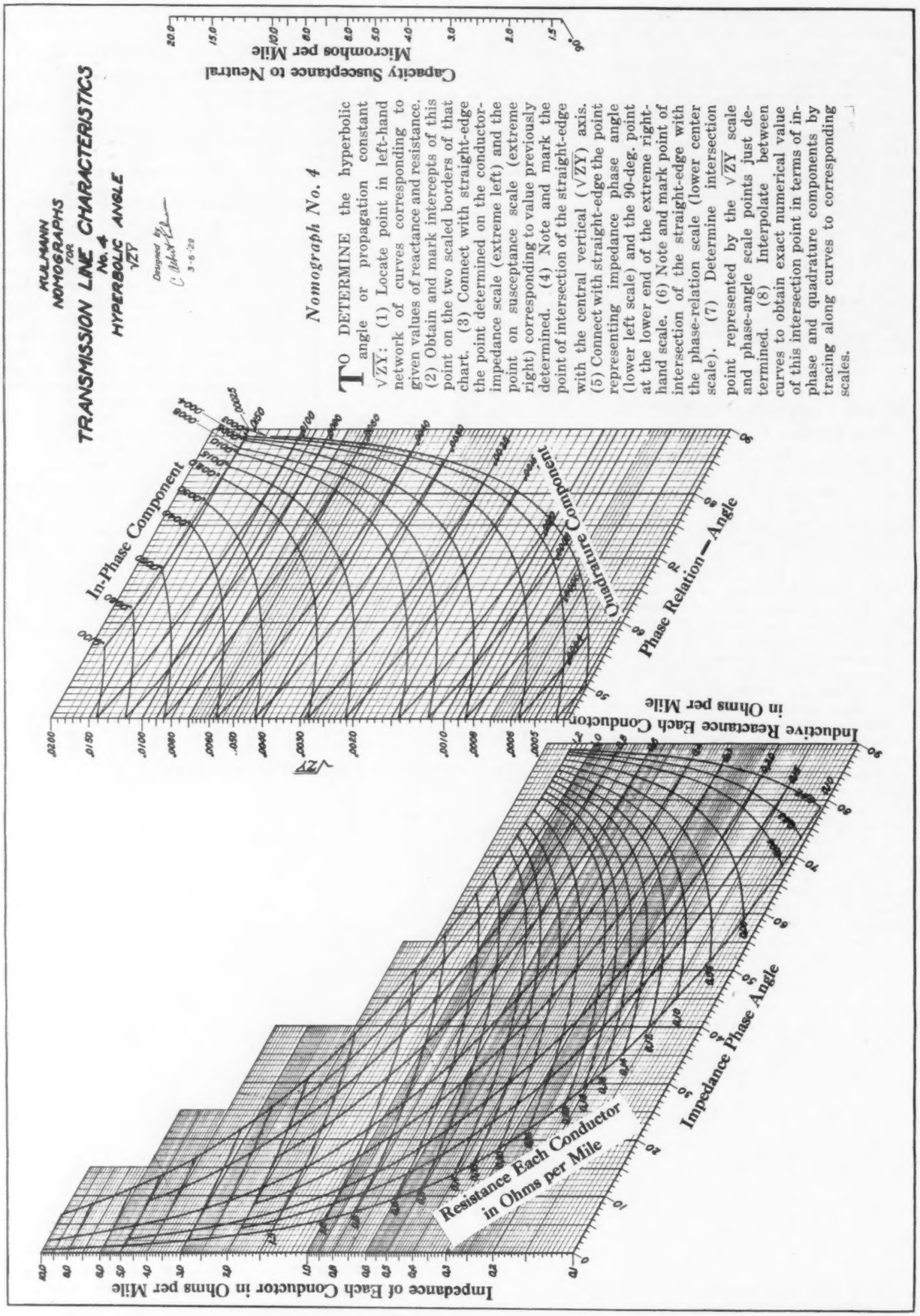
Certain of the Westinghouse pin-type insulators now are made with a metallic glaze in the line-wire and tie-wire grooves of the insulator cap. This metallic glaze, used instead of the usual ceramic glaze, provides a metal-to-metal contact where the conductor touches the insulator, but of course does not affect the insulating qualities of the rest of the insulator.

It is claimed that with this design such charging current as flows does so quietly and without the usual sputtering and arcing as was the case when there was a high-resistance contact between insulator and conductor. Radio interference caused by "static" discharge at these insulators thus is reduced materially. Tests using insulators of identical size showed that the radio interference from the insulators with the metallic-glazed groove was scarcely noticeable at 90 kv., whereas with the insulator with only a ceramic glaze the interference was intense at 25 kv.

Distribution Construction



ORINDA substation of the Pacific Gas and Electric Company was described in Electrical West of May 1, 1928, pp. 268-9, but space did not permit the inclusion of the accompanying general view. The station is a typical unattended unit such as the company uses for installations of 2,250 kva. maximum and having a high-tension (110 or 60 kv.) supply. The view above shows the 11-kv. rack (left), the 4-kv. rack and the small house for telephone and metering equipment and miscellaneous supplies. The 11-kv. oil circuit breakers are of the automatic-reclosing type. The single outgoing 4-kv. feeder is tied solidly to the 4-kv. transformer bus, but as load grows to sufficient proportions plans call for direct transformation from 60 to 4 kv.



Nomograph No. 4

TO DETERMINE the hyperbolic angle or propagation constant $\sqrt{ZY}$: (1) Locate point in left-hand network of curves corresponding to given values of reactance and resistance. (2) Obtain and mark intercepts of this point on the two scaled borders of that chart. (3) Connect with straight-edge the point determined on the conductor-impedance scale (extreme left) and the point on susceptance scale (extreme right) corresponding to value previously determined. (4) Note and mark the point of intersection of the straight-edge with the central vertical ($\sqrt{ZY}$) axis. (5) Connect with straight-edge the point representing impedance phase angle (lower left scale) and the 90-deg. point at the lower end of the extreme right-hand scale. (6) Note and mark point of intersection of the straight-edge with the phase-relation scale (lower center scale). (7) Determine intersection point represented by the $\sqrt{ZY}$ scale and phase-angle scale points just determined. (8) Interpolate between curves to obtain exact numerical value of this intersection point in terms of in-phase and quadrature components by tracing along curves to corresponding scales.

Nomograph for the Determination of the Hyperbolic Angle

By C. ALBERT KULMANN, Pelton Water Wheel Company, San Francisco.

DETERMINATION of the generator voltage and current on a transmission line when the conditions at the receiving end are known is a long, tedious process. This is true even when one of the approximate methods is used assuming some localization of capacitance effect. When the exact form of solution is used the problem is further lengthened and complicated. Various charts have been devised for simplifying the work, but almost without exception such charts are based upon approximate equations and in some cases extreme inaccuracy of the equation makes the use of the charts of very little practical value.

The charts or "nomographs" of this series (of which that shown on the facing page is the fourth to be presented in Electrical West) were designed to simplify the work ordinarily involved. Since they are based upon exact equations the only errors involved are those occurring due to inaccuracy in reading the scales. The equations for voltage and current characteristics as used in the preparation of these charts are:

$$E_1 = E_2 \cosh \sqrt{ZY}L + I_2 \sqrt{\frac{Z}{Y}} \sinh \sqrt{ZY}L$$

and

$$I_1 = I_2 \cosh \sqrt{ZY}L + E_2 \sqrt{\frac{Y}{Z}} \sinh \sqrt{ZY}L$$

where E_1 and I_1 are voltage and current conditions, respectively, at the generator; E_2 and I_2 are voltage and current values, respectively, at the receiving end; L is the length of the line, Z is the line impedance in ohms per mile (equal to the square root of the sum of the squares of resistance and inductive reactance per unit length); Y is the susceptance of the line in mhos per mile (equal to the product of 2π times the frequency times the capacity in farads since the leakage in power transmission lines is negligible). The quantities Z and Y, of course, are complex quantities.

To simplify the work, the symbols V, U and W are taken to represent

$$\sqrt{ZY}, \quad \sqrt{\frac{Z}{Y}} \quad \text{and} \quad \sqrt{\frac{Y}{Z}}$$

respectively, and the equations become

$$E_1 = E_2 \cosh YL + I_2 U \sinh VL$$

and

$$I_1 = I_2 \cosh VL + E_2 W \sinh VL.$$

After determining the values of reactance and suceptance from the charts previously published (Electrical West, April 1, 1928, p. 214; May 1, 1928, p. 274; and Dec. 1, 1928, p. 336), the constants V, U and W are found from additional charts.

With these characters evaluated, the line characteristics are determined and the line constants are defined completely so that with the final charts of the series, as they will be published, it will be possible to evaluate current and voltage over a wide range of conditions and with but very small expenditure of effort and time and with an accuracy that depends almost entirely upon the use of the chart itself.

Assuming constants A, B and D as representing those portions of the equations which are fixed and constant in any given transmission line, the equations as they are found finally become

$$E_1 = E_2 A + I_2 B$$

and

$$I_1 = I_2 A + E_2 B.$$

Hyperbolic Angles or Propagation Constants

In using chart No. 4 of this series (see facing page) for the determination of the hyperbolic angle or propagation constant follow the step-by-step procedure as outlined. First, find the intersection in the left-hand network of curves which corresponds to the given values of reactance and resistance per unit length of transmission line (ordinarily 1 mile). Then obtain the intercepts of this point on the two-scaled borders of the graph by following downward to the one and diagonally upward along the sloping lines of the chart to the other. The use of a sharp, soft pencil is recommended for marking the points so located. This process evaluates the impedance both as to magnitude and as to phase relation.

From the point just found on the verticle axis corresponding to the magnitude of the impedance lay a straight-edge to the point on the susceptance scale (extreme right) which corresponds to the value of susceptance as previously found and note the intersection of this straight-edge with the central vertical axis denoted as $\sqrt{ZY}$. As may be seen, leakage is assumed to be negligible as is true in actual practice.

Next connect with the straight-edge the point on the lower scale of the left-hand chart and representing the impedance phase angle previously found with the 90-deg. point at the lower end of the extreme right-hand scale of the chart and note the intersection of the straight-edge with the lower (phase relation) scale of the central portion of the chart. Thus the second point has been determined and located on this central portion of the chart, one on the left-hand ($\sqrt{ZY}$) scale and one on the lower (phase relation) scale. From these points on the two axes of this central portion follow the cross-hatched guide lines inward to the point of intersection or, in other words, to the point of which the intercepts are the two scale points previously determined. There, by interpolating between the curves adjacent to this intersection point, the values of in-phase and quadrature components may be read directly.

Example

Assume, as an example, a case where resistance is known to be 0.16 ohms per mile, and reactance is 0.6 ohms per mile. Following through the points outlined above the impedance is found to be 0.62 (left-hand scale of left-hand chart) with a phase angle of 75 deg. (lower scale, left-hand chart). Assuming a value of susceptance at 6.0 micromhos per mile to neutral, and the angle as 90 deg., of course, and again following through steps as outlined above, points are determined on the axes of the central portion of the chart which indicate the magnitude of $\sqrt{ZY}$ as 0.00195 and the angle as 82° 30′ (respectively located on the left-hand scale and on the lower scale of the central portion of the chart). Again following the procedure outlined in the foregoing paragraphs, and following from these two points inward along the guide lines of the charts, the two components (real and quadrature) corresponding to these values are found to be 0.00026 and 0.00194, respectively.

EDITOR'S NOTE: This is the fourth of a series of useful nomographs prepared by the author from mathematical and experimental data. The fifth will appear in a subsequent issue of ELECTRICAL WEST.

NEW BOOKS
for the Engineer

HOW TO WIND DIRECT-CURRENT ARMATURES, by W. E. Hennig, formerly chief instructor, Motor and Generator Department, School of Engineering of Milwaukee, and instructor of Armature-Winding Classes, Milwaukee Vocational School. Cloth bound; 7 x 10 in.; 205 pages; 195 illustrations; appendix and numerous tables. Published 1928 by The Bruce Publishing Company, Milwaukee. Second edition, revised. Price $3.—In the preparation of this text dealing directly with the HOW of armature winding the author has eliminated most mathematical expressions and simplified those few remaining. The book is not a treatise on winding design, but rather deals with practical problems. The book should be of service to the electrician, the electrical student and to others interested in the subject. More than 200 questions and problems are included in the text.

ELECTRICITY UNIT—PART I. A set of "process and information sheets" prepared by V. E. Anderson, instructor in electricity, and edited by H. C. Thayer, state supervisor of teacher training, Wisconsin, for use in vocational schools. 8½ x 11 in.; bound in folder; illustrated. Published 1929 by McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York. For sale by Technical Book Shop, 883 Mission St., San Francisco. Price 35 cents each, $4 per doz.—This book comprises a set of 19 sheets devoted to 15 "processes" covering the fundamentals of wire splicing, soldering and taping. These are suitable for use in school shops where the elements of the trades are being introduced.

STANDARDS YEARBOOK—1929. Compiled by the Bureau of Standards, U.S. Department of Commerce. Cloth bound, 6 x 9 in.; 401 pages. Sold only by the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. Price $1.—This is the third issue of the Yearbook. Among the special features of this particular volume are: an outline of methods employed in standardizing commercial weights and measures; simplied calendar theory; activities of certain foreign standardizing bodies; and a bibliography of recent publications relating to standardization.

Ideas for the Contractor

Bank Lighted From *Panels* in *Ceiling Beams.*

Architectural Detail Preserved and Fixtures Eliminated in Successful Lighting Layout of San Bernardino Contractor

DESIGNED to meet exacting requirements, the lighting system of the new building of the Pioneer Title Insurance & Trust Company of San Bernardino, Calif., employs an unusual technique to achieve a completely satisfactory result.

The electrical work was done by George L. Black, electrical contractor and engineer, of San Bernardino.

Mr. Black was informed that speed, accuracy and cheerfulness were paramount and that he must eliminate all glare, cross shadows, and reflections from glossy desk tops and other surfaces, and that there must be a uniform intensity of illumination at all places so that all employees and customers would benefit equally; and last but not least, that the system should be in harmony with the beauty and dignity of the building.

The chief problem lay in lighting the public space on the main floor. Light from fixtures usually results in excessive lighting nearby and insufficient light at a distance. Often it gives the effect of lowered ceilings and by casting shadows destroys the color effects on the ceiling and in general detracts from the architectural beauty and destroys balance. It was evident also that if sufficient light to illuminate this room were provided from fixtures, the high intensity light from these sources would be within the line of vision.

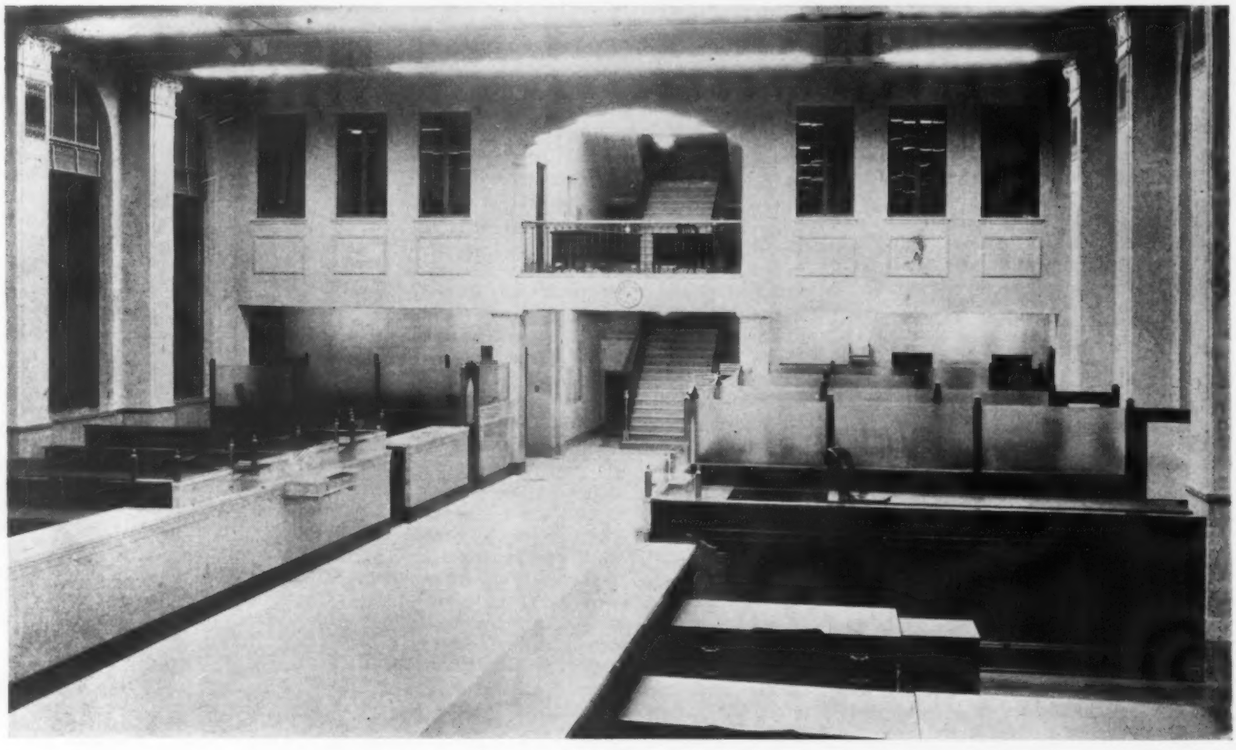
An indirect cove lighting system around the ceiling beams was considered and abandoned as it would cast shadows that would tend to flatten the appearance of the beams.

As all architectural work and decorating in such buildings is done by day under daylight lighting conditions, Mr. Black's idea was to secure a lighting system that would give a maximum of light by night as the sun does by day, distributing the light from the ceiling, then reflecting it back from walls and floor, there being no direct light.

To accomplish this he designed a system that consists of an inverted cove light with cove reflectors concealed in the soffits of the ceiling beams. Belgian flashed opal glass, slightly tinted to soften the light, is used for a diffusing screen and to conceal the reflectors from view. The reflectors stop 2 ft. from the walls to avoid a splash of light on the capitals of pilasters, for the capitals are highly ornamented and light thrown directly on them would spoil the effects of their colors.

The resulting light gives impressiveness to the interior, brings out the architectural beauty and ample proportions of the room, and creates a comfortable, attractive atmosphere. It further provides illumination of proper quality and correct intensity on the working area, giving a soft spray of light gently falling as if from the sky.

Other lighting throughout the entire building was carefully studied and planned to give the most satisfactory

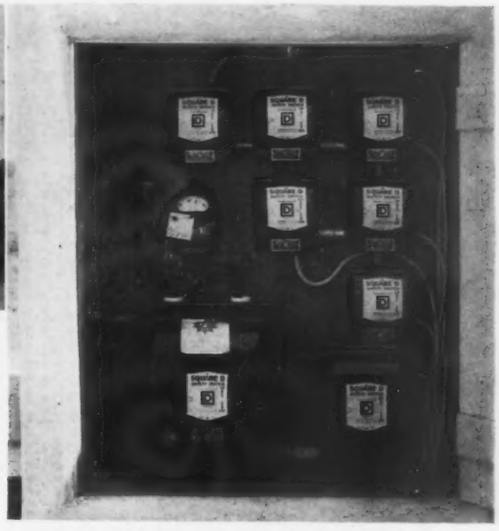


Night photograph of bank taken by light from its series of lighting panels imbedded in the ceiling beams.

results. No desk lights were provided because of the resulting reflection and strain on the eyes of the workers who are required to do close work. In all offices totally indirect fixtures are employed.

In laying out the wiring Mr. Black sold the necessity for providing for future growth. Because of large areas where desks are remote from columns and walls he utilized steel three-channel under-floor duct. The ducts were spaced on 5-ft. centers across the working space, fed every 30 ft. by cross ducts connected through junction boxes. In this case wrought-iron saddles were welded to the duct and the saddles in turn to the steel joists. The duct was set to the grade of the rough floor and used as a screed by the general contractors in pouring the concrete slab.

The floodlighting of this building is one of its most noteworthy features. Lack of space in which to mount the units proved a problem. However, Mr. Black successfully met the situation by concealing the white, amber and red units under the cornices and projections of the building.



Every home in the tract, represented by the one pictured above, had a well laid out meter cabinet like the one above.

Superior Jobs *for the Selling* of Red Seal

IT IS never too late to sell an adequate and superior job. Not even the fact that a contract has been let for the wiring has been found a barrier to Jack Kohl, superintendent for Waxon Brothers, Sacramento electrical contractors.

By selling the builder the advantages of the superior job, more than once Mr. Kohl has been given the wiring even after it had been let for an ordinary installation to a less progressive competitor.

The tract of fourteen homes, all Red Seal or better, at Swanson Park, south of Y St. on Fourteenth in Sacramento, is a case in point. Here Mr. Kohl sold Jim Burnett, the general builder for the syndicate, the advantage of the superior wiring installation.

As a result, every one of these fourteen homes was wired for range, water heater, air heaters of the built-in flush type in all bath and bedrooms, and there are two heavy-duty heater plugs in each additional room for the use of portable heaters. Number twelve wire was used on all plug outlets and four to a circuit was the limit.

Attractive flush-type lighting panel cabinets were installed in the pass hall or on the back porch of each home to give accessibility to the lighting fuses in the house. A refrigerator outlet was provided as well as one for washing machine or ironer on the back porch. Radio plugs for aerial and ground were installed and an aerial roughed in so that the house would not be defaced. Even the telephone circuits were provided with conduit and pullbox.

The main service was in 1½-in. pipe with three No. 2 wires. A 200-amp. entrance switch was used in most cases, a 60-amp. switch for every range and 30-amp. switches on every circuit of heavy-duty plugs. One of the switch and meter boards is reproduced in the picture above.

Mr. Kohl believes in constructive selling of wiring, has a pride in workmanship, and knows and explains the reasons why the superior installation is cheapest in the long run. From this type of work he has had many repeat orders and a great deal of work has been given to him by builders, architects and owners without competition.

League Sponsors Lighting Drive on Offices

DURING the last few months the British Columbia league organized a special drive aimed to secure better lighting conditions in offices, stores and manufacturing plants in this territory. This drive took the form of three letters which were addressed to the stores, an additional three letters written from the point of view of the factory owner, while the third series of letters was addressed to owners of offices.

In the store series the benefit of light from the point of view of assisting sales, of attracting attention in store windows, and of general improvement in sales volume was stressed. The prevention of accidents, the reduction of waste and the increase of high quality and continuous output by efficient lighting in factories was stressed in the letters sent to owners of manufacturing concerns, while the elimination of eyestrain and fatigue, with resulant absence from work by office employees, plus a general speeding up in the work of the office staff were the features on which the letters to owners of offices were written.

All letters concluded by offering the services of the league's illumination engineer free of charge for the purpose of making a survey of the lighting conditions in the office, factory or store to which the letter was addressed. These letters received very favorable attention and as a result secured a large number of new wiring and lighting contracting jobs for contracting and wiring members of the league.

Radio is considered as one of the specifications which should be included in all Red Seal wiring by Mr. Hart, secretary-manager of the league. He will use his influence to have better radio wiring made a necessity before certificates can be granted a house during the coming year.

Using a SPACE FACTOR

By OTTO WIEMER
Department of Electricity, Los Angeles.

CONVERTIBLE WIRE AND CONDUIT TABLES

SIZE WIRE		Dia. over Ins.	Rub. Ins.	Var. Cam.	Oth. Ins.	NUMBER OF WIRES IN ONE CONDUIT								
B & S Gage No.	Area in Cir. Mils	Inch	A	B	C	1	2	3	4	5	6	7	8	9
			Amperes			TOTAL AREA OF CONDUCTORS, Sq. In.								
Stranded 18	1,624	15	3	-	5	.018	.036	.054	.072	.090	.108	.126	.144	.162
16	2,583	.16	6	-	10	.020	.040	.060	.080	.100	.120	.140	.160	.180
Stranded 14	4,107	21	15	18	20	.037	.074	.111	.148	.185	.222	.259	.296	.333
12	6,530	23	20	25	25	.043	.086	.129	.172	.215	.258	.301	.344	.387
10	10,380	27	25	30	30	.056	.112	.168	.224	.280	.336	.392	.448	.504
8	16,510	.30	35	40	50	.069	.138	.207	.276	.345	.414	.483	.552	.621
Solid-SB 14	4,107	20	15	18	20	.031	.062	.093	.124	.155	.186	.217	.248	.279
12	6,530	.22	20	25	25	.038	.076	.114	.152	.190	.228	.266	.304	.342
10	10,380	25	25	30	30	.049	.098	.147	.196	.245	.294	.343	.392	.441
8	16,510	.29	35	40	50	.065	.130	.195	.260	.325	.390	.455	.520	.585
Stranded 6	26,250	41	50	60	70	.13	.26	.39	.52	.65	.78	.91	1.04	1.17
5	33,100	44	55	65	80	.15	.30	.45	.60	.75	.90	1.05	1.20	1.35
4	41,740	.46	70	85	90	.17	.34	.51	.68	.85	1.02	1.19	1.36	1.53
3	52,630	49	80	95	100	.19	.38	.57	.76	.95	1.14	1.33	1.52	1.71
2	66,370	.52	90	110	125	.21	.42	.63	.84	1.05	1.26	1.47	1.68	1.89
1	83,690	.59	100	120	150	.27	.54	.81	1.08	1.35	1.62	1.89	2.16	2.43
0	105,500	.63	125	150	200	.31	.62	.93	1.24	1.55	1.86	2.17	2.48	2.79
00	133,100	.68	150	180	225	.36	.72	1.08	1.44	1.80	2.16	2.52	2.88	3.24
000	167,800	.73	175	210	275	.42	84	1.26	1.68	2.10	2.52	2.94	3.36	3.78
0000	211,600	.79	225	270	325	.49	.98	1.47	1.96	2.45	2.94	3.43	3.92	4.41
	200,000	.77	200	240	300	.47	.94	1.41	1.88	2.35	2.82	3.29	3.76	4.23
	250,000	.86	250	300	350	.58	1.16	1.74	2.32	2.90	3.48	4.06	4.64	5.22
	300,000	.94	275	330	400	.69	1.38	2.07	2.76	3.45	4.14	4.83	5.52	6.21
	350,000	.99	300	360	450	.77	1.54	2.31	3.08	3.85	4.62	5.39	6.16	6.93
	400,000	1.03	325	390	500	.83	1.66	2.49	3.32	4.15	4.98	5.81	6.64	7.47
	450,000	1.08	338	435	550	.92	1.84	2.76	3.68	4.60	5.52	6.44	7.36	8.28
	500,000	1.12	400	480	600	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
	550,000	1.19	425	510	640	1.11	2.22	3.33	4.44	5.55	6.66	7.77	8.88	9.99
	600,000	1.23	450	540	680	1.19	2.38	3.57	4.76	5.95	7.14	8.33	9.52	10.71
	650,000	1.27	475	570	740	1.27	2.54	3.81	5.08	6.35	7.62	8.89	10.16	11.43
	700,000	1.30	500	600	760	1.33	2.66	3.99	5.32	6.65	7.98	9.31	10.64	11.97
	750,000	1.32	525	630	800	1.39	2.78	4.17	5.56	6.95	8.34	9.73	11.12	12.51
	800,000	1.36	550	660	840	1.45	2.90	4.35	5.80	7.25	8.70	10.15	11.60	13.05
	850,000	1.40	575	690	880	1.54	3.08	4.62	6.16	7.70	9.24	10.78	12.32	13.86
	900,000	1.43	600	720	920	1.60	3.20	4.80	6.40	8.00	9.60	11.20	12.80	14.40
	950,000	1.46	625	750	960	1.68	3.36	5.04	6.72	8.40	10.08	11.76	13.44	15.12
	1,000,000	1.49	650	780	1000	1.75	3.50	5.25	7.00	8.75	10.50	12.25	14.00	15.75
	1,100,000	1.61	690	830	1080	2.04	4.08	6.12	8.16	10.20	12.24	14.28	16.32	18.36
	1,200,000	1.66	730	880	1150	2.16	4.32	6.48	8.64	10.80	12.96	15.12	17.28	19.44
	1,250,000	1.68	750	900	1190	2.22	4.44	6.66	8.88	11.10	13.32	15.54	17.76	19.98
	1,300,000	1.70	770	920	1220	2.27	4.54	6.81	9.08	11.35	13.62	15.89	18.16	20.43
	1,400,000	1.75	810	970	1290	2.40	4.80	7.20	9.60	12.00	14.40	16.80	19.20	21.60
	1,500,000	1.79	850	1020	1360	2.52	5.04	7.56	10.08	12.60	15.12	17.64	20.16	22.68
	1,600,000	1.83	890	1070	1430	2.63	5.26	7.89	10.52	13.15	15.78	18.41	21.04	23.67
	1,700,000	1.88	930	1120	1490	2.78	5.56	8.34	11.12	13.90	16.68	19.46	22.24	25.02
	1,750,000	1.91	950	1140	1520	2.85	5.70	8.55	11.40	14.25	17.10	19.95	22.80	25.65
	1,800,000	1.92	970	1160	1550	2.89	5.78	8.67	11.56	14.45	17.34	20.23	23.12	26.01
	1,900,000	1.97	1010	1210	1610	3.05	6.10	9.15	12.20	15.25	18.30	21.35	24.40	27.45
	2,000,000	2.00	1050	1260	1670	3.14	6.28	9.42	12.56	15.70	18.84	21.98	25.12	28.26

LIMITING TOTAL AREA OF CONDUCTORS FOR CONDUIT SIZES

NUMBER OF WIRES IN ONE CONDUIT.	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
	Use for Three (3) or Four (4) 90 deg. Bends - - - Code Table 1.												
3 or More -	124	217	345	.621	.840	1.36	1.96	2.94	4.14	5.22	6.64	8.30	11.56
2 Only. - -	.091	.160	.260	.420	.620	.980	1.54	2.38	3.20	4.08	5.04	6.28	--
	Use for One (1) or Two (2) 90 deg. Bends - - - 60 Ft. Limit.												
3 or More -	137	240	390	650	910	1 47	2.10	3.08	4.41	5.70	6.96	8.89	12.80
2 Only. - -	.100	.176	.300	.500	.680	1.16	1.66	2.54	3.36	4.32	5.26	--	--
	Use for Straight Conduit - - - - - - - - - 60 Ft. Limit.												
3 or More -	152	266	430	750	1.02	1.68	2.39	3.69	4.95	6.37	7.98	10.00	14.25
2 Only. - -	.114	.204	.330	.570	.77	1.27	1.80	2.78	3.70	4.80	6.10	--	--
	Use for Calculating Space Factors.												
Inside Dia	622	824	1.048	1.38	1.61	2.07	2.47	3.07	3.55	4.03	4.51	5.05	6.06
Inside Area	.304	.533	.861	1.50	2.04	3.36	4.78	7.38	9.89	12.73	15.96	20.00	28.90

BECAUSE Section 614-e of the 1928 National Electrical Code allows the use of a common neutral for several feeder circuits, there is urgent necessity for a suitable table for determining conduit sizes for different combinations of wires.

For combinations not included in Tables 1, 2 and 3, Section 503-q, the national code leaves the choice of conduit sizes to the authority enforcing the code and recommends that a space factor of 40 per cent not be exceeded. In California this situation has been met very satisfactorily by using Table 703-3(b) in the Electrical Safety Orders of the State Industrial Accident Commission, but this table is based on a space factor greater than 40 per cent and gives results that do not always agree with the present recommendations of the national code.

The accompanying table was planned with the primary idea of producing a convertible table for wires of different sizes which, when applied to groups of wires of the same size, would duplicate Table 1 of the national code with as few exceptions as possible. This feature seemed essential to insure consistency with a table that has stood the test of years of experience and to reduce the necessity of further experience.

For the convenience of the Los Angeles contractors, the table was extended to apply not only to a 40 per cent space factor in a four-bend table but also to the higher space factors for two bends and for straight conduit which are allowed for limited distances by the Los Angeles wiring rules.

In the case of straight conduit, the limiting space factor for two wires had to be made smaller than for three or more wires, due to the fact that with a 50 per cent factor two wires would fill the conduit exactly and would be impractical to install. To be on the safe side, space factors were also made smaller for the two-bend and the four-bend tables. While this adds a complication, it is consistent with the code tables which do not allow more than approximately 30 per cent for any of the two-wire combinations.

As an added convenience, stranded wires down to No. 16 and 18 gage were included in the tables because these sizes are sometimes used for control wires. Solid single-braid wire dimensions were tabulated separately for No. 14 to No. 8 gage wires in order to include combinations allowed in the note following Table 1 in the national code. A table of inside diameters and areas of conduit was added for reference in calculating space factors.

It will be noted that the arrangement of the upper part of the table is similar to Table 1 of the national code. The main difference lies in the fact that conduit sizes are not given directly in the columns for the number of wires. Total areas for groups of conductors are given instead, and these areas have to be compared with the limiting total areas in the lower tables to determine the size of conduit required.

When there are two or more groups of wire sizes, their respective areas are added and their sum is then compared with the limiting areas in the lower tables. Care must be used to select the proper table for the number of bends and to use the limiting areas found on the line for two wires only, or for three or more wires, as the case may require. A few examples will illustrate the method of using the table.

A Few Examples

Required: the size conduit for two No. 14 and two No. 12 solid single-braid wires in a run requiring four bends. Referring to the upper tables, in the section for solid SB wires, find the areas .062 and .076 in the two-wire column opposite the No. 14 and No. 12 sizes respectively. Their sum is .138. Referring this sum to the four-bend section of the lower tables and using the

—National Code Tables Converted So That Such a Method May Be Applied Easily

BASIS *for Figuring Wire Sizes*

line for three or more wires, the smallest limiting area that exceeds .138 will be found to be .217 in the ¾-in. column. Therefore, ¾-in. conduit will be required.

Even if the run of conduit had only one or two bends, ½-in. conduit could not be used, since the total area of conductors, .138, exceeds the limiting area, .137, in the two-bend table for ½-in. conduit. Where the difference is so small, special permission could safely be granted if conditions justified.

Required: the size conduit for three No. 6 conductors in a 30-ft. run with two bends. The total area from the tables is .390 sq.in. Referring to the two-bend section of the lower tables, the limiting total area for three or more wires is exactly .390 in the 1-in. column, and this size conduit will be permitted. This combination has been much used for range wiring and has been recommended by article committees of the National Fire Protection Association in their advance publication of reports.

The following is given to illustrate the necessity of a lower space factor for two-wire combinations.

Required: two No. 4 wires in a run with four bends. The total area of conductors is .340. If this combination were installed in a 1-in. conduit, the space factor would be only 39.5 per cent, which is less than 40 per cent, yet the code requires 1¼-in. conduit. Using the limiting area in the table for two wires only, in the four-bend section, 1¼-in. conduit is required as in the code table.

A final example is given to illustrate the use of the table for conduit sizes when paralleling large conductors.

Required: the conduit and wire sizes for a three-wire feeder of 650-amp. capacity with a 100-ft. run having four bends. Assume rubber insulation is specified. Using the table for allowable carrying capacity, there would be a choice between three 1,000,000-circ.mil conductors, or six 400,000-circ.mil conductors paralleled in pairs. The former would require 4-in. conduit according to the national code, but 4½-in. is obtained by using this convertible table. This difference was made purposely on account of the evident difficulty in trying to install this combination in a 4-in. conduit with a run having four bends and an unlimited distance. The latter combination with six conductors would require only a 4-in. conduit and would probably be chosen from considerations of cost.

These examples are sufficient to show the many uses and advantages of a convertible table of this kind. It has its shortcomings in common with all tables which only take into account the room required for the wires in the conduit.

Friction the Limiting Factor

Friction is really the limiting factor and this is affected by many other important considerations, such as flexibility and weight of conductors, the nature of their surface, the character and radius of bends, the deflection of wires at outlets when pulling them into the conduit, besides many others. Perhaps the most important of all is the human element. These things cannot all be taken into account in any table. In other words, the necessity for good judgment and common sense can never be ignored.

Water Lubricated Bearings on Large Pump

THE highest-duty turbine pump ever constructed was installed recently and is in operation for the Etiwanda Water Company of Etiwanda, Calif.

This pump breaks all records in size and lift. The weight of the pump is 60,000 lb. It is installed in a well 450 ft. deep and not only raises the water from this depth but boosts it an additional 190 ft., making a total head of 640 ft. The water is boosted to a hill where it is redistributed to lines and laterals for use in irrigating.

Etiwanda is located in the heart of the deep-well district where many pumps are operating at depths of from 300 to 400 ft. and several at 550 ft. The lifting and boosting of the water is accomplished in one operation. A novel feature of the design is the fact that the bearings are water lubricated. In the usual oil lubricated bearing some trouble is experienced in clogged oil lines, which may cause oil failure and bearing trouble. For this reason this pump has been constructed to use the water as a lubricant.

Largest vertical pump in West, with total pumping head of 640 ft.

Water with sand intrusion causes rapid cuttings of the bearings, but in this design the bearings are of a type that cannot be destroyed rapidly by sand. Furthermore, any sand that creeps into the bearings is washed out without permitting metal-to-metal contact.

This is the largest pump that has ever been installed with the special water lubricated bearings.

All of the parts for this pump were constructed in the factory of the Pomona Pump Company of Pomona, Calif., with the exception of the motor, which is a Westinghouse 350-hp., 50-cycle, 960-r.p.m., ball bearing, vertical solid shaft design.

New Building Code Allows Use of Welding

THIRTY-EIGHT municipalities on the Pacific Coast now have sections in their building codes covering the electric welding of buildings, according to an item in the General Electric Review for April. These cities, now operating under the regulations laid down by the Uniform Building Code, have followed the lead of Sacramento and Alhambra, which adopted that code late in 1927.

They are as follows: Sacramento, Alhambra, Fontana, Redlands, Oceanside, San Bernardino, Laguna Beach, Pomona, Fresno, Piedmont, San Rafael, Coronado, El Monte, Ontario, San Jose, Visalia, Fullerton, San Francisco, Pittsburg, Claremont, Walnut Creek, Tulare, National City, San Fernando, Livermore, Berkeley, Martinez, Compton, Corcoran and Madera, California; Eugene and Klamath Falls, Oregon; and Prescott and Tucson, Arizona.

According to the new building code section for these cities, it is now legal for the commissioner of buildings in each place to grant, in the same manner as for riveted frames, permits for the erection of electricaily welded steel building frames also.

Section 2710 of the Uniform Building Code authorizes the use of welding and sets forth the essential elements needed by engineers and architects in working out the designs for welded joints in steel beams and columns used in building construction.

MOTOR

for and by Motor Men in the Interest of a Better Motor Trade

Old Barber Chair Proves Valuable Tool

"ONE OF the most useful tools in our shop," say Backstrand Bros., of Riverside, Calif., speaking of the old barber chair which they have converted into a portable work stand. The seat was taken from the old barber chair and on the heavy, wooden frame upon which it originally rested was laid a 2-in. platform, the top of which was covered with sheet metal. Then the entire stand was mounted on casters so as to be movable.

The result is an extremely handy and flexible table upon which to do all kinds of work around a motor shop. Its particular advantages are that it can be raised or lowered to a desired height. When winding a small motor this is particularly advantageous as the level of the work can be raised or lowered to fit the comfort of the workman. The table can be revolved at will, and the entire work moved from place to place about the shop as required.

Shop Questions Answered

Q. We have a number of aluminum castings which have become discolored. How can we clean them?——H.M. Co.

A. Wash these castings with a solution of 30 parts borax in 1,000 parts of water, with a few drops of ammonia added.

Q. Will acid clean old files?—G.N.S.

A. Yes; acid will clean old files and make them better, but acid will not restore old, worn-out files.

TORQUE — *and What it Means*

A correct understanding of the wide variance existing in the starting effort required to overcome static friction and inertia between one machine and another, or between different groups of machines, is absolutely necessary to the correct analysis and solution of motor-drive problems. To illustrate this point let us take two extremes:

First, a direct connected fan where the required torque is only that exceedingly small amount needed to overcome bearing friction. Second, a line shaft with ordinary sleeve bearings, faulty alignment, tight belts, driven machines being punch presses with large fly wheels, or any other form of load which has a high coefficient of friction with large inertia.

Consideration of these two examples will prove that we have the two extremes of starting duty. One case has the minimum of stress imposed on the motor, while the other case represents the usual conditions to be met in industrial plants and machine shops.

Any machine, or group of machines, requires a certain amount of torque to overcome its inherent friction losses before it can be put in motion at production speed. The amount of torque necessary is dependent upon many variable factors. Some of these factors are as follows:

1. Type of machine.
2. Manner in which machine is connected to driving mechanism.
3. Quality and viscosity of oil used in bearings.
4. Room temperature.
5. Number and pliability of belts.
6. Alignment of shaftings.
7. Diameter of driven pulleys.
8. Condition of belting.
9. Variance of total friction losses, due to velocity and other factors.

Torque Capacities of Motors

For purposes of comparison between the different types of d.c. and a.c. motors, it is interesting to consider certain data compiled by the General Electric Company engineers.

Percentage of Starting to Full Load Torque

	Per Cent
Direct Current	
Series winding	300
Compound winding	200-250
Shunt winding	150-200
Alternating Current—Single Phase	
Light load start (no clutch)	35
Medium load start (clutch)	150
Heavy load start (clutch)	200
Polyphase	
Standard winding	250
Commutating Pole—Direct Current	
Series winding	350
Compound winding	250
Shunt winding	225

The investigations of these engineers also show that the proportion between starting torque developed by the three more common types of direct current motors, and the starting current needed to develop this torque is approximately as follows:

Series winding—350 per cent torque with 250 per cent of full load current.
Compound (standard)—250 per cent torque with 200 per cent of full load current.
Shunt—225 per cent torque with 190 per cent of full load current.

Further tests by these engineers have given the following relation between starting and full load torque for a.c. polyphase motors:

Standard constant speed motors (2 and 3 phase), 1 to 50 hp.
Two, four, and six-pole = 175 to 200 per cent.
Eight- and ten-pole = 125 to 150 per cent.
Twelve-pole = 100 to 125 per cent.

Determination of Required Torque

There are many ways of determining by simple methods the approximate torque or foot-pounds needed to put a machine, or group of machines, in motion. One of the simplest is by means of an accurately calibrated scale of almost any type (platform, spring, etc.) and a lever of any con-

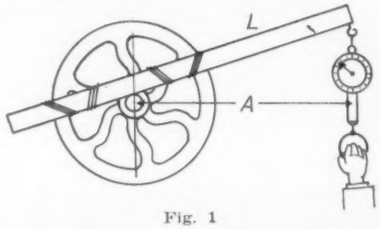


Fig. 1

venient length and of sufficient strength to stand the strain to be put upon it. Fig. 1 shows the manner of attaching the lever and the use of a spring balance scale.

If the number of pounds pull be noted at the instant rotation is effected, and the distance between center lines of shaft and scale are known, the foot-pounds torque required can be computed from these two factors by mutiplication. If no type of scale is available, a rough test may be made as shown in Fig. 2.

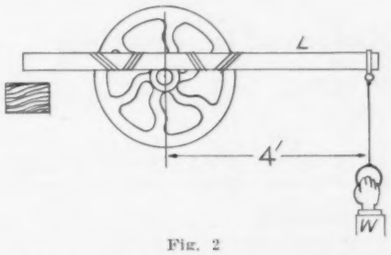


Fig. 2

In this case the lever is attached as shown, and a person of known weight is suspended from the lever at a given point. This point is shifted along the lever until rotation takes place. The distance between center of shaft and point of suspension, multiplied by the known weight, will give the foot-pounds as before. (The center distance, of course, must be taken in feet.) Still another method, where no lever is available, is shown in Fig. 3.

To show the use of these methods, let us consider some typical cases. Suppose, in Fig. 2, the weight is 150 lb., and the point on lever necessary to cause rotation is 4 ft. The necessary starting torque therefore equals $4 \times 150 = 600$ ft.-lb.

By consulting the data sheets of the type of motor the dealer is selling he can ascertain readily the type of motor which will develop this starting torque, in relation to the running torque. For instance, suppose it is known that a certain motor (of proper horsepower and desired speed) will develop a full load torque of 250 ft-lb. and develops a starting torque of 250 per cent. Then there is a starting torque of 250 per cent of 250 ft.-lb. = 625 ft.-lb., which will be just right for the job, although a greater margin would be preferable.

As another example, consider a small line shaft requiring 45 ft.-lb. to overcome the static friction (Fig. 3). If the machinery connected to this shaft indicates a required horsepower of 7½ and it is decided to use a motor of 1,800 r.p.m., then to find the full load torque of the type of motor to be selected, use formula (2):

$$\frac{5{,}250 \times 7.5}{1{,}800} = 21.8 + \text{(or 21.9)}$$

(NOTE: Reference to Table A will show this to be true.)

If we select a type of motor having a starting torque of only 150 per cent we get 21.9×150 per cent = 32.85 lb. As the needed torque is 45 lb. it will be seen that this motor will not do, and it will be necessary to select another type of motor which has a starting torque of 250 per cent. Now we have 21.9×250 per cent = 54.75 lb., which is just right for this job.

This same result could have been obtained by selling the customer a 10-hp. motor having a starting torque of 150 per cent. This would have given a result of 29.2×150 per cent = 43.8 lb. and would probably handle the load satisfactorily, but would cost the customer more money, which is fundamentally poor business as well as poor engineering.

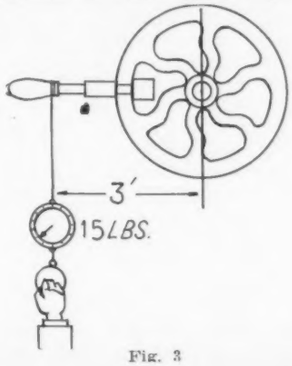


Fig. 3

FORUM

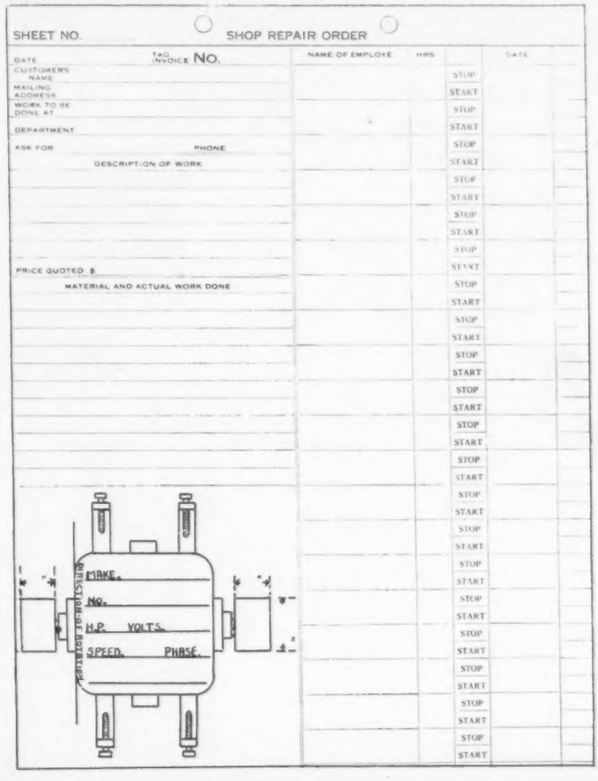
Simple Report on Calls Made by Salesmen

AS A SIMPLE and yet effective salesman's follow-up system, F. W. Buzzell, proprietor of the Buzzell Electric Works, San Francisco, requires his salesmen to jot down on a card at the end of every day a short report of the calls made during the day and what business was accomplished during these calls. From these cards Mr. Buzzell makes a monthly summary of the number of calls, business done, cost of production, the overhead and the profits.

Mr. Buzzell insists, however, that this is not a high-pressure method of sales report. It is merely a note as to the calls made in order that he can check at the end of the month whether too many calls have been made on one man and whether some accounts have been neglected. These reports form the basis of his friendly discussion with his salesmen as to where effort may be concentrated. No forms are used. Only a standard blank file card is used for the report. Mr. Buzzell considers this personal supervision of every contact more valuable than an organized, highly specialized follow-up system.

One Sheet Combines Time Card and Order

ON ONE form the California Electric Works, San Diego, combines its repair shop order and time slip. The time card occupies the right half of the 8½ x 11-in. sheet of heavy ledger paper. On the left-hand side are listed the usual data concerning the customer's address and name, description of work, as well as the price quoted. A space is left for listing material and actual work done. A particular feature of the card is found in the motor diagram at the lower left-hand corner of the sheet. On this chart can be marked the make, number, horsepower, voltage, speed, phase, direction of rotation, pulley size and location, as well as the hookup of the particular motor being repaired.



Community Paper's Name Appropriate for Contractor's Advertising

LIVE WIRE, ALHAMBRA, CALIF., FRIDAY, MARCH 15, 1929 — LIVE WIRE, ALHAMBRA, CALIF., FRIDAY, MARCH 15, 1929

Spring Cleaning and Repair Time IS NOW HERE!
Have Your Electrical Repairs Made Before Decorating
Ask Us
For suggestions in Modernizing your Wiring and Making it adequate. Since you are using Electricity in your home, why not plan to enjoy its full convenience and make it safely and easily available wherever you want it, in every room in the House.
We install New Wiring in your Home neatly in a very little time.
LICENSED AND BONDED BY CITY OF ALHAMBRA
IF YOU ARE BUILDING, LET US TELL YOU ABOUT THE
Red Seal Plan of House Wiring
THIS EMBLEM CERTIFIES
That the Electrical Wiring in this building provides facilities such as convenience outlets, lighting outlets, range outlets, switches and other essentials for the Convenient Use of Electric Service.
The National Red Seal Plan to Assure Adequate Wiring for the Convenient Use of Electric Service in the Home is extended to this community through the California Electrical Bureau, acting as Agent for the Society for Electrical Development.
THE SYMBOL OF ADEQUATE WIRING
We Do all Kinds of Fixture and Appliance Repairs
WE INSTALL RANGE EQUIPMENT and SERVICE for $35.00 to $45.00
BASE PLUG SPECIAL
ALL IN ONE HOME
ONE $4.50
TWO 8.00
THREE 11.25
FOUR 14.00
A $6.00 HOT POINT Super-Iron For $5.00 And Your old Iron
KERNS ELECTRIC CO.
TROUBLE PROOF ELECTRICAL CONTRACTORS
LEAVE IT TO US AND BE SATISFIED
Phone 2122-W
1410 South Garfield Avenue
MORE POWER AND LIGHT TO YOU!
(I do not know if h— is hot or cold, or what sort of place it may be: But this I surely know, that if there is a h— at all, it will be badly lit. —F. R. KERNS)

APPROPRIATELY enough the community newspaper at Alhambra, Calif., is called the "Live Wire." And live wire it is after S. R. Kerns gets through with it. This "live wire" electrical contractor of Alhambra monopolizes the paper by spreading across the interior of the small news sheet a two-page spread as shown in the accompanying illustration. Not satisfied with this dominant position he also runs several other little advertisements in the paper featuring his special price on base plugs.

Mr. Kerns makes a specialty of the Red Seal Plan, and advertising of it is featured in his space. A big feature is made also of rewiring and modernizing.

When Outlets Should Be Mounted High

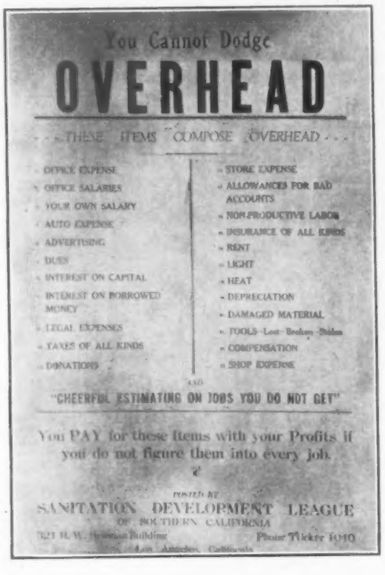
A little thing in itself, but important in certain classes of installation, is the mounting of convenience outlet boxes on pillars in industrial plants in such a way as to escape damage.

In the National Biscuit Company's plant in Los Angeles the Newbery Electric Corporation mounted the switch plates and convenience outlet boxes at a height of about 7 ft. from the floor. This was done because a great deal of trucking is done throughout the plant.

Electric trucks loaded with boxes to a height of about 6 ft. are constantly running up and down the corridors of the plant, delivering stocks to be shipped. It has been found by experience that cords attached to outlets were subject to damage by the moving vehicles. The switch plates and convenience outlet plates, too, were damaged and the plug blocks and often wiring loosened by impact.

High mounting of these boxes, while ordinarily not good practice, in this case was a decided advantage.

"Overhead" Reminder



Posted up conspicuously in every plumbing shop in southern California is the card which tells its own story of overhead. It serves as a constant reminder to the Contractor that the items listed upon it must be taken into consideration in costing any job done. "You Cannot Dodge Overhead" is a strong assertion heading the list. The items composing overhead are listed as follows: Office expense; office salaries; your own salary; auto expense; advertising; dues; interest on capital; interest on borrowed money; legal expenses; taxes of all kinds; donations; store expense; allowances for bad accounts; non-productive labor; insurance of all kinds; rent; light; heat; depreciation; damage to material; tools—lost, broken or stolen; compensation; shop expense and "cheerful estimating on jobs you do not get." The poster ends with the declaration: "You **Pay** for These Items With Your Profits If You Do Not Figure Them Into Every Job."

"Industrial Lighting" is the subject of Bulletin No. 448A of the Holophane Company issued recently, which treats particularly of industrial lighting applications of glassware specially designed for particular types of light distribution.

Selling Points for Good Industrial Lighting

By J. R. WILSON*, Quality Electric Works, Los Angeles.

A second article on the Estimating and Selling of Lighting Installations by the Estimator or Contractor.

FACTORIES are notoriously under-illuminated. The higher the percent of under-illumination, the greater will be the number of accidents and the percentage of "spoilage" and loss of production.

A series of nine tests recently conducted by separate investigators in typical factories showed an average production increase of 15.5 per cent when the illumination was raised from 2.3 foot-candles to 11.2 foot-candles. And the additional lighting cost in the nine plants averaged 1.9 per cent of the payroll!

The selling of a modern lighting installation to the older type of commercial or industrial establishment is not always an easy job.

A contractor may have many discouraging and disheartening experiences when he first starts his campaign of selling. But if he can succeed in making one or more typical installations, even at a very small margin of profit, which can be used for reference, he will find that his job will become easier. The reason for the seeming apathy of the "old school" type of business manager is usually his deep-seated suspicion of any new, and to his mind, untried innovation.

Plenty of Sales Data

While it is very easy to set down on paper what results modern lighting should give, in any sphere of application, the actual degrees of increased production, reduction of spoilage and accidents, etc., are to a degree intangible and theoretical.

However, a great amount of actual data have been collected and tabulated by the public utilities and manufacturers that can be taken as authentic and authoritative. Through the courtesy of the Bureau of Power and Light of Los Angeles we are enabled to present certain tables and graphic data which any contractor may freely use as selling arguments with the assurance that the statements made and figures given represent conservative minimums.

In Fig. 1 is found graphic illustration of the three items which should be of interest to any industrial plant manager.

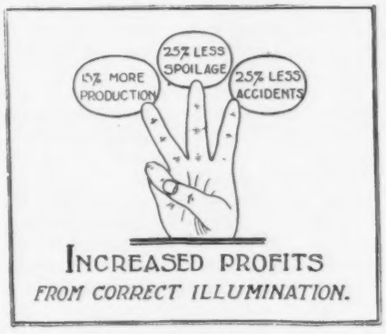


Fig. 1

Table A gives a selling argument which can be applied to almost any line of production.

Fig. 2 illustrates the actual influence of lighting as a cause of accidents. Regarding accidents, the following is of interest:

TABLE A

Shop	Per Cent Increase in Production	Additional Lighting Cost in % of Payroll
Pulley finishing	35.0	5.0
Soft metal bearing	15.0	1.2
Heavy steel machine	10.0	1.2
Carbureter assembly	12.0	0.9
Plant manufacturing electric, gas and sad irons	12.2	2.5
Semi-automatic buffing brass shell sockets	8.5	1.8
Manufacturing piston rings	25.8	2.0
Letter separating (U. S. post office)	4.4	0.6
Inspection in roller bearing plant	12.5	2.5
Average	15.0	1.97

The above increases in production were obtained by installation of modern lighting systems and by increasing the quantity of light as follows: Pulley finishing from 0.2 foot-candles to 4.8 foot-candles; soft metal bearing from 4.6 foot-candles to 12.7 foot-candles; heavy steel machine from 3 foot-candles to 11.5 foot-candles; carburetor assembly from 2.1 foot-candles to 12.3 foot-candles; plant manufacturing electric, gas and sad irons from 4 foot-candles to 13.5 foot-candles; semi-automatic buffing brass shell sockets from 3.8 foot-candles to 11.4 foot-candles; manufacturing piston rings from 1.2 foot-candles to 18 foot-candles; letter separating (U.S. post office) from 3.6 foot-candles to 8 foot-candles; inspection in roller bearing plant from 2 foot-candles to 20 foot-candles.

R. E. Simpson, Travelers Insurance Company, says:

"Our statistics indicate that 15 per cent of industrial accidents are attributable to poor lighting. In 1924, 300,000 accidents were chargeable to this cause, 4,000 being fatal. The workers' compensation paid for these accidents was $90,000,000."

Some prospective customers will argue that the cost of lighting is already too high.

When compared with other essential components of the industrial make-up light is cheap. Fig. 3 shows this.

The contractor should make a careful study of these, and other charts and data, and absorb their significance as related to the class of customers he hopes to reach. A good rule to remember is that there is no such thing as an overstock of bona fide, authentic sales arguments.

Be prepared to meet all types of sales resistance.

After the Sale

After an installation has been made, the contractor, in order to sell other jobs from it, should impress upon his customer the need for observing the following rules. The efficiency and results which the installation has produced, and hence more sales, depend upon them:

1. Light is a salesman and should always be kept in the best of operating condition.

2. This entails frequent use of soap and water to the end that the full reflecting value of the lighting equipment may be realized.

3. All lamp sockets should be kept filled.

4. All lamps which have become discolored should be thrown away.

5. The interior walls and ceilings should be repainted, or at least cleaned, as often as may be necessary to keep the "absorption factor" at the minimum.

6. Whenever possible, the paint used should be of a light color, preferably white or cream color.

Observance of these simple rules will help to make an installation, based upon present lighting practice, a continual source of satisfaction and increased production.

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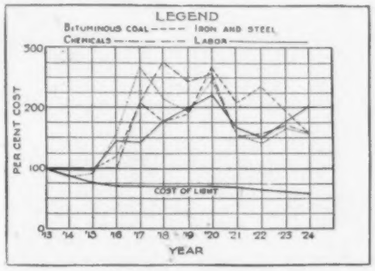


Fig. 2

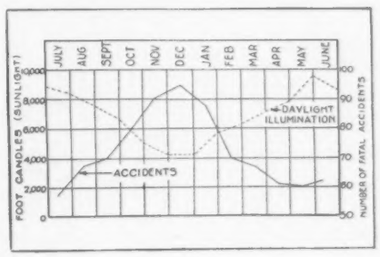


Fig. 3

Better Merchandising

What One Dealer Learned About *Time Payments*

Faults of Commission Sales Remedied by Putting Stress on Cash Sales and Time Payments Only on Thirty-Day Basis

HOW many sales were being made on term contracts that might have been made for cash? How many of these long-term sales were being made that should not have been made at all? These were two of the questions that Mr. Bell of the Broadway Electric Company, of Tacoma, asked himself when he recently became responsible for the sales activities of that company. It was evident from the difficulties the company was experiencing with collections, and the number of reverts of large equipment with their inevitable unprofitable disposal, that sales for this company were being made in many cases on a wrong basis.

After analyzing the situation Mr. Bell found the firm's selling difficulties to be due in large measure to the fact that the large staff of salesmen employed in the field on ranges were remunerated entirely by commissions paid on sales made. As might be expected under this system, the men often offered the bait of a long-term sale to a buyer who was not really ready to purchase or who was not financially able to undertake the payments, and whose credit was therefore doubtful. The number of reverts on hand testified to many sales being forced where no sale should have been made in the first place.

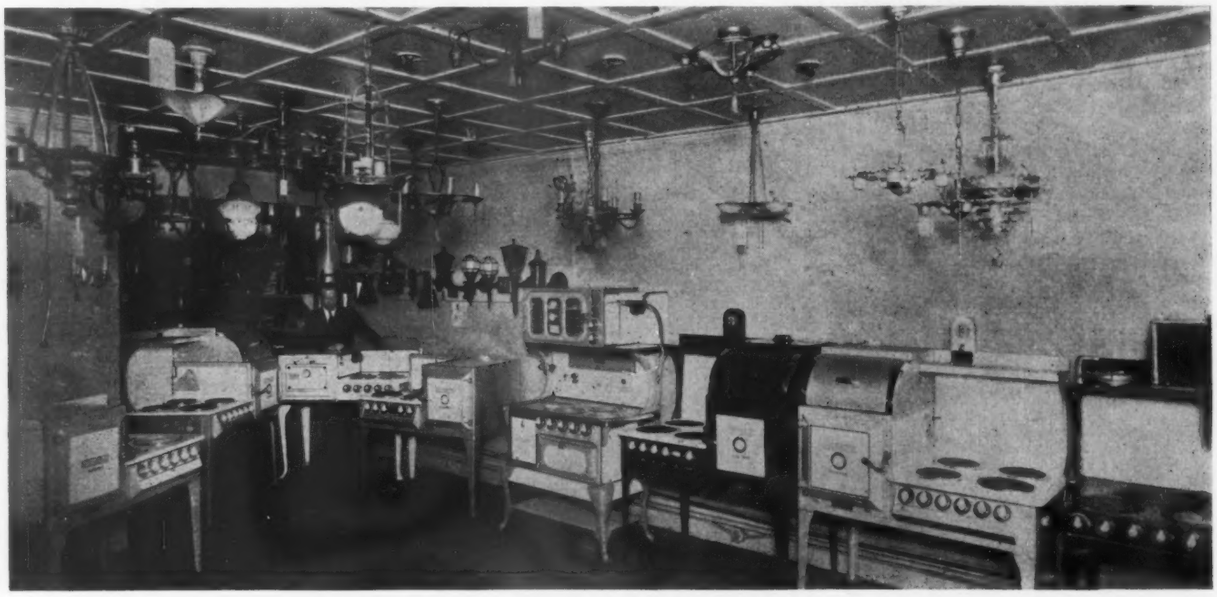
Mr. Bell determined to confine his sales in the future to those prospects who left no doubt as to their ability to pay for what they bought. By doing away with commission salesmen he removed the first obstacle. All remaining salesmen were then given instructions to stress the advantage of the cash sale; to school themselves to think of each prospect they approached as a cash sale; not to mention price until the subject was brought up by a prospect, and then to quote the cash price.

The result was revealing. Salesmen found that it was just as easy to sign up a customer for cash as for time payments. To any prospect who asked about time payments it was pointed out that it would be necessary for him to pay as much as 12 per cent interest on the amount unpaid; that it would be far better business and save him money to borrow the amount from a bank and pay cash for his purchase.

In some cases, of course, a customer may be desirous of paying cash and yet not have the money immediately available. The salesman then puts the question, "How much could you pay down, then—50 per cent?" Being left to name his own amount and with the 50-per-cent figure in his mind, the purchaser will agree to the largest amount that he can take care of at the time. When the salesman then comes back with, "When can you pay the balance—in 30 days' time?" pride will usually again cause the customer to fix the earliest date possible for completing the purchase. If the amount is to be carried over for not longer than a month's time, the salesman carries it personally and waives the interest charge.

Since inaugurating this selling policy the company has issued only three time-payment contracts in three months' time.

These cash customers of the Broadway Electric Company are looked upon by Mr. Bell as splendid prospects for more sales of electrical equipment. The man who owns his range or other appliance is much more apt to have a friendly feeling toward the store where he bought it than the one who is still



A full line of ranges is carried for display and practically all sales are for cash.

making monthly payments. He is free to consider other purchases when he has not the bugbear of several payments ahead to be made on what he already has bought.

Two very costly problems connected with time purchases are eliminated by the cash sale. One is the disposal of second-hand equipment which is taken in for non-payment and the other the time expended by the sales and office force in attending to the details of bookkeeping and collection involved in time purchases.

In the selling of ranges, of course, the company still has a number of trade-ins to dispose of where electricity is put in to displace a coal or gas range. If a salesman sells an electric range to displace one of another make which he takes in in trade, the trade-in is put on the sales floor with the company's ranges and is used as a sales argument with prospects for buying the company's range.

Other equipment taken in in trade by the company is sold through want-ads in the classified section of the newspaper. A salesman will always urge a housewife, however, to adopt this method of disposing of smaller equipment herself rather than turn it in for the small amount that he can allow her for it on her new purchase.

In cases where the company disposes of second-hand equipment through the want-ad method, the telephone number of the store is given but not its name, and in this manner a prospect for an electric range is often uncovered. The company also frequently answers ads of ranges of various kinds for sale. Often these are being disposed of so that they may be displaced by more desirable equipment, and thus a sale of an electric range can be made for the company.

The same selling policy is to be adopted for refrigerators and ironers, according to Mr. Bell. In selling ironers he emphasizes the importance of refraining from over-selling. Often a customer sees an expert demonstrator displaying perfect results with an ironer and then is disappointed when she finds that upon her first attempt at home she does not achieve such gratifying results. In answer to such complaints Mr. Bell draws the analogy of the automobile. "You would not expect to drive a car in traffic the first day, or the first week you learned to drive, would you?" he asks. "Well, neither can you operate this machine expertly without practice. It will take a little while for you to be 'an expert driver' so don't be discouraged. Simple things which make up the bulk of your wash you can do at once and the rest will come before you know it." He has cleared up many doubts with this bit of advice.

"What is best for the store is best for the customer" is the policy that Mr. Bell has adopted, and results are proving every day that this and its corollary are true for both in the long run.

Only One Danger—Says Installment Credit Advisor

"IN YOUR desire to set new sales records, there is but one danger to look out for," Roman J. Greil, official of the Commercial Investment Trust Corporation, told a recent meeting of the Electrical Credit Association at Philadelphia. He went on to day:

"Too often the electrical merchant, through the use of high pressure methods, has sold the installment plan and failed to sell the appliance. As a result the purchaser has no genuine interest in the appliance and collection difficulties inevitably follow. These instances are the exception, arising from faulty merchandising methods and careless credit practice."

Mr. Greil stated that when the average American citizen buys an article he really wants on the time payment plan he is one of the best credit risks to be had, and that in many years of experience with hundreds of thousands of installment purchasers, his company's losses have been negligible.

The Bargain Window Brings Them In

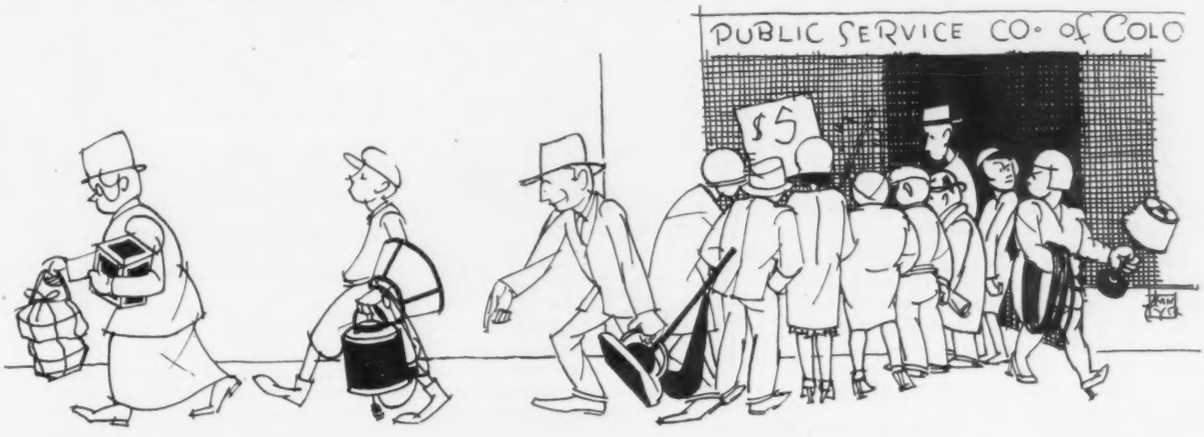
AN extraordinarily successful sale of electrical appliances put on by the Public Service Company of Fort Collins, Colo., cleared out 210 appliances in one day by means of a "Five Dollar Window Sale."

One Wednesday morning W. B. McSpadden, new business manager, and his men, piled 245 different articles into the display window and offered any of them at $5 the following Saturday. In the merchandise were 175 varieties of appliances. Some were old and some new; some obsolete.

The window display advertised the event for three days. Promptly at 9 o'clock Saturday morning the sale began, and by night 210 items had been disposed of.

One of the bright spots in the sale was that all purchases were for cash.

The firm has found it advantageous to install and maintain a bargain basement where, like many department stores which have similar departments, it is able to dispose of many new and re-conditioned appliances at popular prices profitable both to the company and the purchaser.



Schoolboy scout with arm badge and kit advancing to the front doorstep.

Mobilizing Against

With a Corps of Schoolboys Forming the Diego Consolidated Gas & Electric

SUBSTANTIAL victory, in spite of temporary reverses along some fronts, was gained by the San Diego Consolidated Gas & Electric Company in its recent campaign against empty sockets over its territory. Although its goal of a lamp for every lighting meter, or "50,000 lamps by Christmas," was not directly realized in the campaign, it was estimated that allied troops in the form of dealer sales and Christmas-tree lighting made the victory certain for the territory.

The heaviest reverses came during a flu epidemic after signal victory of 20 per cent of quota had been reached the first week of the drive. But when Christmas came a rough check of gains made showed the sales well over 35,000 lamps with some districts still to be heard from.

Now that the drive is over more interest attaches itself perhaps to the plan of campaign used than to the actual drive and its results. What particular strategy was employed, and how effective would it be in another drive of a similar nature? Of this plan of campaign it can be said that it would prove effective again almost anywhere.

How It Was Organized

The plan of campaign as originated through the combined efforts of the San Diego company's commercial, merchandising and advertising department involved many angles of customer, employee and schoolboy interest.

First came the employee co-operative plan. Special order blanks were printed and these together with sample kits were distributed among employees. Employees were encouraged in their sales efforts by their respective department heads both through bulletin announcements and personal interest.

"The Socket"

Additional interest among the employed personnel was first kindled and then maintained through the weekly appearance of "The Socket," a newspaper size broadside printed in vivid colors. These were distributed to all employees.

The initial issue announced the plan of campaign, the employee commission of 20 cents per six lamps sold and the prizes to be awarded those selling the highest number of lamps, providing the sales quota reached the 50,000 mark.

Succeeding issues carried letters of encouragement from department superintendents together with an "Honor Roll" and a report of the progress of the campaign to date.

Next came the arranging of an extensive advertising campaign to include, besides newspaper advertising, a message to every customer on the reverse side of the company's monthly postcard bill. The new style government return postcard was also used to good advantage for distribution over the counter by every employee dealing with the public.

The following message was printed on the postcard:

BETTER BE SAFE THAN SORRY!

Fill the empty sockets with the new inside-frosted Westinghouse Mazdas!

When lamps burn out or get broken, replace them at once. Don't be annoyed or

NEW LOW PRICES!
Assortment of Six
$1.39
NEW LOW PRICES!
Assortment of Six
$1.39
More Light for Less Money
Bring your home up-to-date with the latest product of the great Westinghouse Laboratory—the new inside-frosted Westinghouse Mazda Electric Lamp.
These new type highly efficient lamps provide an abundance of well diffused light with less eye straining glare.
They are the "latest style" in light bulbs and actually give more light for less money—both in the cost of lamps and the amount of current consumed.
It is real economy to replace all the old lamps with the new type Mazda.
To introduce the new lamps we are staging a big sales drive to cover our entire territory. JUNIOR LAMP SALESMEN will call at your home. Every employe of this company will also be able to take your order.
The Lamps Will Be Delivered and Charged to Your Account at Any of Our "ELECTRICAL HAPPINESS STORES"
SAN DIEGO CONSOLIDATED GAS & ELECTRIC CO.
Sixth at E
San Diego
Oceanside
Capistrano
Escondido
La Jolla
Chula Vista
Coronado
La Mesa
Lamps are something you'll always need—Keep a spare supply handy!

One of the large broadside advertisements fired in the campaign.

Empty Sockets

Advance Guard, All Employees of the San Company Went Into the Field

Lamp kit window display, originally designed for the La Mesa office, which was transported and rebuilt in the main display window of the "Electrical Happiness Store" of the San Diego Consolidated Gas & Electric Company. It not only attracted a great deal of attention, but sold a good many handy lamp kits.

inconvenienced by empty sockets. The Westinghouse Handy Lamp Kit contains six of the newest inside-frosted, easy-to-clean lamps in assorted sizes suitable for the various rooms of the home.

These new types of lamps provide an abundance of diffused light, relieving eye strain. It's real economy to replace old lamps with these new-type highly efficient Westinghouse Mazdas.

Sign your name and address on this card. The Handy Lamp Kit will be delivered and we will charge it to your account. Pay for them next month when you pay your light bill.

SAN DIEGO CONSOLIDATED
GAS & ELECTRIC CO.

Hand-painted posters and sample kits were very much in evidence at the company's main office and seven district offices. Ten-foot pyramids of lamp kits also proved great attention gainers.

Perhaps the most complicated part of the entire sales campaign was the drafting of 76 schoolboys and educating them to the proper methods of selling lamps. The same commission offered employees was paid to the schoolboy salesmen who made a systematic house-to-house canvass of the entire territory.

Field representatives of the merchandising department were allotted four boys each and held responsible for the sales efforts of their teams. Each boy was identified by wearing a cloth arm band on which was printed the company emblem and the words, "Handy Lamp Kit Salesman." The boys went to work immediately after school and remained in the field until 5 o'clock.

The first hour and a half was devoted to intensified selling; the last 30 minutes to the distribution of advertising cards bearing the following message:

"THIS IS TO LET YOU KNOW
I'LL BE BACK AGAIN
TOMORROW
to ask you to buy a
Westinghouse
Handy Lamp Kit.

When lamps burn out or get broken, replace them at once. Don't be annoyed or inconvenienced by empty sockets. The Westinghouse Handy Lamp Kit contains six of the newest inside-frosted, easy-to-clean lamps: one 100-watt, two 60-watt, two 40-watt and one 25-watt—all for $1.39.

These new-type lamps provide an abundance of diffused light relieving eye strain. It's real economy to replace all the old lamps with these new-type, highly efficient Westinghouse Mazdas.

I'll take your order tomorrow and have the lamps delivered. You have the option of paying at time of delivery or having them charged to your account at the—

SAN DIEGO CONSOLIDATED
GAS & ELECTRIC CO.

One thing more! Would you like to have me reserve for you a beautiful 1929 calendar with hand painted illustration by Gene Pressler? If so, just sign this card and a calendar will be set aside for you.

The Results

Over 35,000 lamps in 35 selling days was the record in lamp sales established. The actual number of lamps sold ran a fraction over the 35,000 mark, but an average of 1,000 lamps a day through concentrated efforts is a record that this utility is proud of and one that it hopes to pass this year.

"Orders not Alibis" was the motto that the San Diego company's merchandising department applied to the lamp sales campaign. All assistance from employees was of a voluntary nature. The results obtained indicated that there was an interest in the drive over and above the commissions paid.

Contrary to expectations, the results of the campaign have been very marked in increasing lamp sales during the succeeding months. Without a doubt the effort expended in selling this large number of lamps in a given time identified the central station as a place to buy lamps and the average daily sales have increased 150 per cent over the pre-campaign records.

A recent check of the number of lamp sales made outside of the kits showed that the public is now demanding a higher wattage lamp for general use while the standardization of sizes and types met a favorable response.

A summary of the results also showed that the employees, other than those connected with the merchandising department, sold 50 per cent of the total number of lamps. Although the organization of the campaign was not intended to create a spirit of departmental rivalry, the weekly issue of "The Socket," campaign publication, showed various departments in competition with each other. The meter reading department made the best showing, accounting for over 4,000 lamp sales. Everyone sold lamps, including the general manager, and praise has been given the executives and department heads for the practical and active co-operation they rendered in encouraging employee sales.

"What Makes a Good Store Location?"

A RECENT bulletin of the Department of Commerce sets forth the essentials of a good store location in the following summary and analysis:

1. Foremost among these is the number of passers-by. Hence the location should depend largely upon accessibility or convenience to street cars and main arteries of traffic.

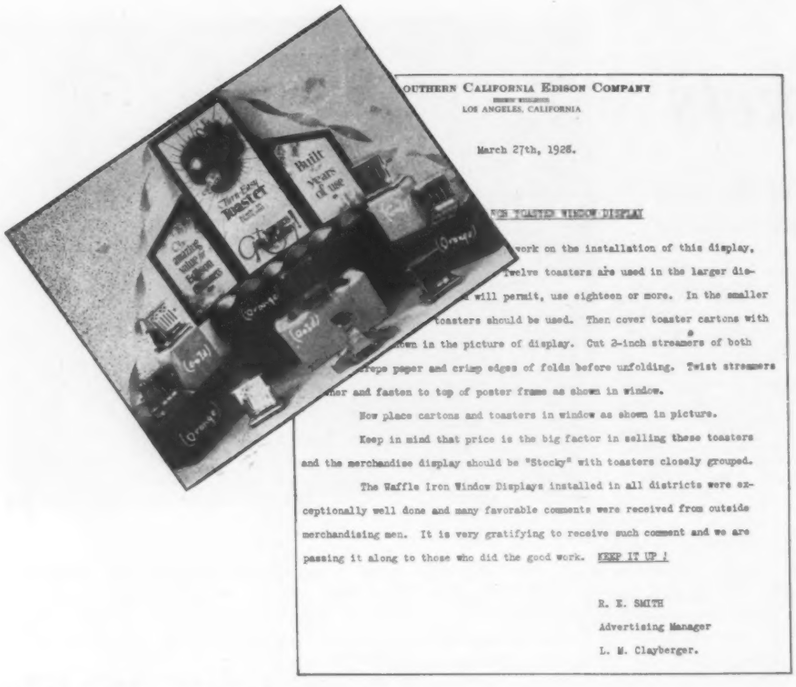
2. Whether a location is in the shopping district or uptown, and the direction of growth of the city, should also be considered in deciding on a permanent location.

3. The side of the street may be important, i.e., whether it is on the shady or sunny side and in what relation to the prevailing winds.

4. The types of surrounding buildings enter into the question and rentals are obviously an important consideration, too righ rents, as well as poor locations, accounting for many failures.

5. The buying power of potential purchasers as determined by their income should also be taken into account, as should the religious and other customs of the people, their characteristics, racial and cultural, and the character of local industry.

It is pointed out that a given store site seldom combines the highest advantages in all of these points but it must be evaluated in terms of them if a correct average or composite value is to be assigned to it.



SOUTHERN CALIFORNIA EDISON COMPANY
LOS ANGELES, CALIFORNIA

March 27th, 1928.

...ON TOASTER WINDOW DISPLAY

...work on the installation of this display, ...welve toasters are used in the larger display ...will permit, use eighteen or more. In the smaller ...toasters should be used. Then cover toaster cartons with ...own in the picture of display. Cut 2-inch streamers of both ...type paper and crimp edges of folds before unfolding. Twist streamers ...ner and fasten to top of poster frame as shown in window.

Now place cartons and toasters in window as shown in picture.

Keep in mind that price is the big factor in selling these toasters and the merchandise display should be "Stocky" with toasters closely grouped.

The Waffle Iron Window Displays installed in all districts were exceptionally well done and many favorable comments were received from outside merchandising men. It is very gratifying to receive such comment and we are passing it along to those who did the good work. KEEP IT UP !

R. E. SMITH
Advertising Manager

L. M. Clayberger.

Letter and photograph giving instructions for the setting up of the standard window display.

Organized to Make

Edison

Special display trucks, planned standard displays and demonstration equipment prove valuable to this active selling utility company.

IN ATTEMPTING to further the merchandising program which it has set up for itself for 1929 the Southern California Edison Company has inaugurated a window-trim service for its district offices. This service, which is a part of the advertising department, is in direct charge of L. M. Clayberger, with S. R. Holland and David Braddick actually carrying on the routine duties.

A new Ford truck has been prepared especially for this service. With this truck the two window-trim men make the rounds of the Edison system, exclusive of the San Joaquin Valley territory, every three weeks. On each side of the display car a special frame has been built in which the particular appliance special being featured at any time may be pictured and the sales story told. This poster is covered with glass to protect it from the weather and keep it fresh and clean.

This provides service to 58 offices, which makes it necessary to trim an average of four windows each day.

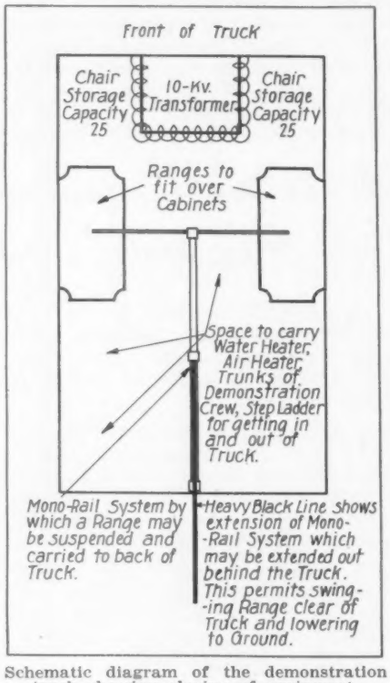
A new style of window display material now is being furnished the offices of the Southern California Edison Company through this newly organized display department. The center piece consists of a plate of ground glass upon which the silhouette has been painted in black. Directly behind the pictured lamp on the ground glass a 60-watt bulb is located which tends to heighten the illusion.

This type of window trim costs from $40 to $50 apiece. Each of these displays is transferred from office to office from five to ten times, thus bringing the cost chargeable to each district for one of these displays to between $5 and $10 apiece.

The window display service had its beginning in a more simple way. The start was such that any utility could duplicate it with good effect.

How Service Started

The beginning was made in connection with the small appliance specials which the Southern California Edison Company featured every other month throughout the year. It was desired that each district office be furnished with window display material and full instructions for its use.


Front of Truck
Chair Storage Capacity 25
10-Kv. Transformer
Chair Storage Capacity 25
Ranges to fit over Cabinets
Space to carry Water Heater, Air Heater, Trunks of Demonstration Crew, Step Ladder for getting in and out of Truck.
Mono-Rail System by which a Range may be suspended and carried to back of Truck.
Heavy Black Line shows extension of Mono-Rail System which may be extended out behind the Truck. This permits swinging Range clear of Truck and lowering to Ground.

Schematic diagram of the demonstration truck showing placing of equipment.

Preliminary to sending out this material, a sample window display was prepared and photographed, and a copy of this photograph was sent out to each of the offices. The three-panel frame was standard equipment in each of the offices and by the insertion of different sets of cards as backgrounds could be used for any type of window.

This service proved the value of window trimming standardization and the work under Mr. Clayberger was enlarged to its present proportions to care for the increased sales activities of the company this year. Even now the original type of service is maintained for those districts not served by the truck and for other specials to all offices occasionally.

Thus a high quality of window trim is provided all offices at practically no bother to the offices themselves. No important work is interrupted to make time for window display and first-class equipment and special effects are available to every office at a fraction of the expense of such a display for each office alone.

As a further development of the organized display idea the Edison company has just added another feature to its retinue.

The Portable Demonstration

Two hundred two-day electric cooking demonstrations will be carried on over the company's system during 1929, according to the plans of H. C. Rice, merchandising manager.

These short demonstrations will be held in the small centers of population throughout the system. To make these demonstrations practical and to eliminate, as far as possible, up and down costs of wiring for temporary range installations, two specially designed auto trucks have been built.

Inside each of these trucks a 10-kw. transformer is permanently mounted. This transformer is encased in a wire safety cage placed immediately behind the driver's seat on the inside of each truck. Over the driver's compartment is a box in which is carried 150 ft. of 5,000-volt flexible cable. One end of this cable is permanently connected to the transformer inside of the truck, the other end is so fitted as to permit it

Southern California

*D*isplays *E*ffective

in all parts of the company's system

The new display service truck.

to be pulled up to a service line and made fast, through primary fuses mounted on a board which is hung on the cross arm with standard transformer hangers.

A 9-ft. pole is mounted on the roof of the truck. When the truck is traveling from place to place this pole folds down and lays along the top. When the truck is in place for use the pole is raised to a perpendicular position and held in place by three guy wires. Through a hook on the top of the pole the primary cable is threaded from the crossarm of the pole to the service transformer in the truck.

The top of the truck is 9 ft. from the ground and the extra 9. ft of pole gives a total of 18 ft. clearance for the line as required by state law.

Inside of the truck two special frames have been constructed upon each of which an electric range can be mounted. The ranges fit down over these frames and are effectively prevented from moving when the trucks are in motion.

The frames upon which these ranges are mounted are made up in the form of a chest or cabinet in which the various food staples used in the demonstrations may be carried from place to place. There is additional space for a demonstration electric water heater, electric air heater and for the personal baggage of the demonstrator.

Each truck carries 50 folding chairs as part of its standard equipment.

Inside of the trucks a mono-rail system has been built which makes it possible for one man actually to load or unload a range from the truck. Each truck carries a set of steps which can be hooked to the rear to help in the loading and unloading processes.

A window in the San Bernardino office with one of the new standard window trims set up. The two small appliance specials which were being offered by the company at the time this picture was taken are shown tastefully arranged in the foreground of the window. The price appeal is injected into the display with the two very attractive cards with the special low price offered on the appliances.

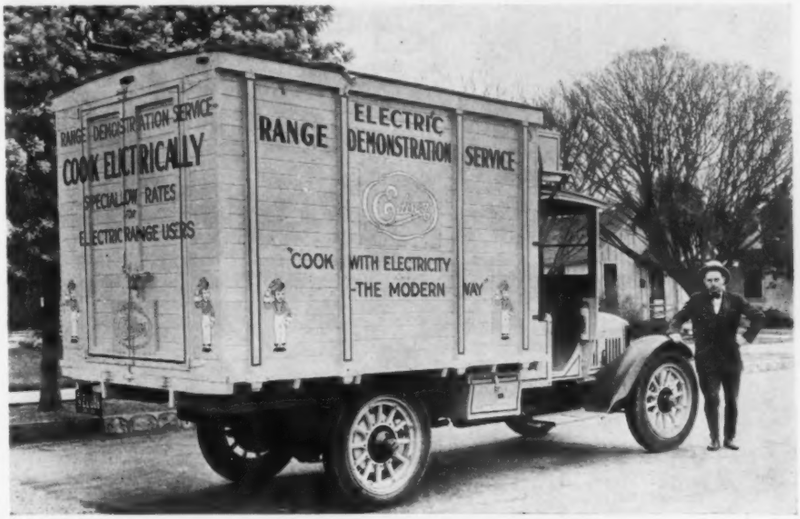
The trucks are painted a brilliant orange with black lettering. One man is in full charge of each truck and has as his assistant a woman demonstrator. It is this man's duty to act as advance agent in making dates for these demonstrators.

Demonstrations are held in schools, women's clubs, and churches, or in the company offices where the space permits. It is intended that each of these demonstrations shall be attended by from fifteen to twenty women. The classes are usually held from two to four in the afternoon. Occasionally it has been found possible to have an afternoon class and an evening class on the same day.

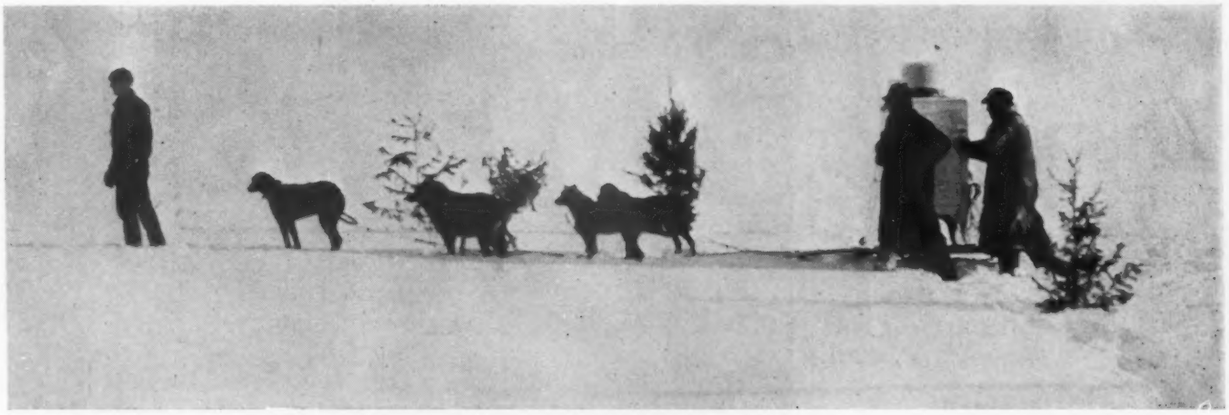
Invitations not to exceed 300 are sent out to a selected list in the community in which the demonstration is to be held. In addition to this, newspaper advertisements, three-column six-in., inviting the general public to these demonstrations, are used wherever it is possible to get newspapers which cover the field.

It is intended that these demonstrations shall be definitely devoted to the object of selling ranges. While it is anticipated that a large number of prospects will develop from this work, the company will not feel that its program has been properly carried out if actual sales do not result from these cooking parties.

Sales specialists in given districts are notified as to the time and place of each demonstration and they are expected to have their best prospects attend these meetings. It is felt that as the program develops the necessity for invitations and newspaper advance copy will diminish, as the sales organization will be able to provide a sufficiently large audience from its own prospect lists.



Demonstration truck loaded and ready for the tour.



Snowbound roads meant nothing to a dog team when a Rexburg, Idaho, purchaser insisted on having his refrigerator right away.

Proving Once and for All That

Refrigeration in Winter Time Is Necessary—and Can Be Sold

Though It Takes Dog Team to Make Deliveries

DELIVERY of a refrigerator by dog team to one of its customers in Rexburg, Idaho, was a sensation recently provided by the Utah Power & Light Company.

This novel means of transportation was made necessary by the fact that the present winter was the most severe experienced in the territory known as the company's Idaho Falls division during the last 40 years.

This refrigerator was delivered on Feb. 8, at which time highways and many streets were snow-blocked, and the temperature was around 29 deg. below zero.

The problem of making delivery of the refrigerator presented a baffling situation because practically every form of transportation was paralyzed, but the dog team idea came to the rescue, and the customer, F. L. Erdman, a prominent business man of Rexburg, received his purchase safe and sound at his home. Very little difficulty was experienced by the team and driver.

The team of dogs used was the one which participated in races at Rexburg on Feb. 4, and was owned and driven by V. J. Davis.

This incident is a striking example of the fact that electric refrigeration is in demand not only in spring,summer, fall and ordinary winter weather, but also in the severest kind of winter season.

Mr. Erdman very definitely stated that he had become completely "fed up" on the inconvenience and nuisance occasioned by having to remove four or five inches of frozen milk from the bottle every morning, and the necessity of using an ax on meat that had acquired the hardness of concrete as a result of the cold weather.

Delivered safely to the doorstep by the dog team the refrigerator came to Mr. Erdman's rescue, saving him from frozen milk and rock-like meat.

Light Diet for Fish

FISH feeding is the newest work to which electricity is being put in the San Joaquin Valley.

J. P. Shellenbarger, Fresno resident, has two 1½-acre ponds in which he raises carp and catfish for market. A large portion of their diet consists of bugs which descend unwarily to the surface of the water, are involved in a sudden commotion and disappear.

Large electric lights suspended immediately above the surface of the water serve to attract these bugs to the pond and aid materially in furnishing sustenance for the hungry fish.

Direct Mail—

It Made a Stuttering Salesman Successful
It Helped Sell Extra-Difficult Prospects
It Kept a Sales Staff Always on Its Toes

By J. E. Bullard

ONE SALESMAN in the power department of a central station could not talk effectively because he stuttered so. His speech went along a good deal like a flivver with worn out points in the coil boxes, yet he proved the star salesman of the department.

Since he could not talk in the most convincing manner, he wrote letters. Some of these he delivered in person and some he mailed. At night he composed and wrote letters on a typewriter in his home. Most of his selling had to be done by means of letters.

Not only did he make more sales than the other salesmen but they were better made. What he sold stayed sold. This was partly due to the fact that he had to use his head more than the others. He could not sit down and write letters without doing some solid thinking, and as a result when he did make a sale the customer was thoroughly satisfied. Because it forced him to use direct-mail matter effectively his affliction proved an asset rather than a liability.

¶ A public utility sales manager wanted to sell a certain number of appliances every day. The number was greater than his few salesmen could possibly sell so he used direct mail. He tested out the mailing pieces till he could tell what results to expect, then adjusted the number mailed daily to bring in the amount of business he desired. The idea worked. All the business that could be taken care of conveniently was secured.

For Difficult Prospects

¶ Another sales manager had his salesmen morking on very difficult prospects. In the past very little business had been secured from these prospects. He used letters to pave the way for the salesmen and to introduce them. As a result the salesmen had very much less difficulty in closing sales.

Clean Up Field

¶ Direct-mail matter has another advantage. After all the sales it can make alone are made there is a lot of business left on the list that is all ready to to be closed by salesmen. A book concern used this fact to good advantage.

Through advertising and direct-mail matter it secured all the business it could. Then it turned the rest of the list over to well trained salesmen and had them follow it up. These salesmen had no difficulty in getting from that list as much more business as had already been secured. The company could rest assured, however, that these men were not getting a lot of easy business that would have come in anyhow. They had to do a certain amount of work and

At night he composed letters.

earn the money paid them. The total volume of business secured was many times what it would have been had only one means of making sales been used.

¶ Perhaps the most spectacular case of direct-mail advertising, however, is that of a drugstore product. A small druggist in a little town put up a preparation that gained great favor among his customers. People who went away from the town would order it by mail.

Finally it was decided to manufacture it in quantity and sell it nationally. However, the cost of selling it through a sales force seemed too high. Therefore, direct-mail advertising was used and without employing a single salesman complete national distribution was secured and this preparation now can be bought in practically any drugstore in the United States.

Gets In Where Salesmen Fail

Direct-mail matter has the advantage of getting in where salesmen may have difficulty. It can get into every house, apartment, every private office—into any place, no matter how exclusive. Even though it eventually reaches a waste basket on the way, it is sure to make some impression no matter how speedy the trip may be.

¶ A business executive who always insists that he never reads any direct-mail matter, that he always throws it into the waste basket without even glancing at it, had occasion to write to a concern doing a great deal of direct-mail advertising. When he dictated the letter, the name of one member of that concern came instantly to mind, so he directed the letter to him. This man's name appeared nowhere except on circular letters. The repetition of the name staring up from letters that were consigned immediately to the waste basket apparently had had an effect.

Fit the mail matter to the task to be performed and results that are often surprising will be secured. Follow up the mail matter and other advertising with salesmen and the maximum volume of business is bound to be secured.

Check-Up on Salesmen

¶ A central station sales manager discovered that his salesmen were not really working. They brought in some business. In fact they brought in enough to seem to warrant paying them all that was being paid them, but they had become friendly with the contractors and other people who could give them information and had found ways of getting a line on business before it came into the office. They spent so much time looking up the easy business and getting orders for it that they had little left for going out and actually digging up business that would not just naturally come into the office. Something had to be done.

This sales manager tried direct-mail advertising in addition to the newspaper advertising that was being done. Salesmen were credited only with sales they actually made from lists of prospects furnished them. These lists consisted of names from which no replies had been received and names of those who requested that a salesman call. No name was given to a salesman, with the exception of the names of those who requested that a salesman call, until several weeks after the last mailing piece in the campaign had been mailed.

From that time on those salesmen not only got more business but they got business that would be unlikely to come into the office of its own accord. They spent their days digging up new business and not looking for the easy business. They actually earned what they were paid.

¶ The dealer may feel that he is not capable of writing direct-mail material that will do for him what it has done for others. He may not have time to write it, or believes he has no time. The cost of preparing it may seem high for his business to stand.

But he should remember that every manufacturer makes available to him excellent direct-mail material. Many manufacturers have plans whereby all the detail of mailing is taken care of by them. The only effort required of the dealer is preparation of a list of names and addresses to whom the material may be sent (in the dealer's name) by the manufacturer.

Certainly in this age of co-operative selling methods and manufacturers' help in selling no electrical contractor should find himself deprived of this extremely effective sales weapon—direct mail.

News of the Industry

Trade Commission Nearly Finished With Publicity Phase of Investigation

Washington Correspondence

IN THE resumption of the investigation of public utilities being made by the Federal Trade Commission no witnesses were called in the hearing of March 20, the session being spent in submitting exhibits for the record. A number of the exhibits itemized utility expenses incurred in the campaigns against the Water and Power Act, which is the commission's chief point of attack in questioning California witnesses.

The investigation continued on March 22 with the questioning of W. L. Frost, commercial manager, Southern California Edison Company, and former president, Pacific Coast Electrical Association. Particular attention was devoted to the thrice-defeated California Water and Power Act, against which action was taken by individual power companies but not by the associations as such.

Contributions from the Pacific Coast Division to the N.E.L.A. have been running between about $20,000 and $30,000 per year, Mr. Frost stated. For the year ending June 30, 1928, the assessment was in round numbers $64,000, of which $32,000 was refunded to the local branch.

Mr. Frost described the activities of the Light and Power Association, which is a loosely organized group of electric company executives. It was brought out that this group has been in a position to make recommendations for membership in the advisory committee of the California Electrical Bureau. The Light and Power Association also cooperated with farm organizations by contributing $5,000 to $8,000 per year toward rural electrical research at the University of California.

Voluminous exhibits were introduced as evidence, including minutes of the Pacific Coast Electrical Association, marked to show the sentiment of individual members towards publicity measures, state versus private ownership, and other matters under inquiry. Listings also were given covering the efforts of several large power companies to promote harmonious public relations. These tables showed the date and place of speeches, plant visits, and illustrated lectures conducted for the benefit of civic associations, clubs, and groups having to do with the school, farms, business, churches, fraternal orders and the like.

Utility efforts against public ownership in the Northwest were outlined by Norwood W. Brockett, of Seattle, public relations director of the Puget Sound Power & Light Company, in the hearing of March 28. The Bone Bill, submitted as a referendum, was decisively defeated and the Erickson Bill never came to a vote. One hundred and seventy-five thousand dollars of utility money, nearly half of which was for advertising, went into the campaign against these measures.

Through his connection with the Northwest Electric Light and Power Association, and as chairman of the Washington state committee on public uitility information, which handled the power company opposition and was subsequently discontinued some three years ago, Mr. Brockett was active in the legislative battle.

In the publicity campaigns citizens' committees were organized, and all legitimate means were used to bring the true facts before the people. No paid watchers were put at the polls although company employees were there with cards and handbills. Other industries joined the electric companies in the publicity. It was emphasized that all these endeavors were perfectly regular.

The witness testified regarding surveys of municipally operated utilities within the state and told how his company had opposed the extension of such lines into territory served by the company. "We object to competing against an unregulated and untaxed concern," he said.

Concerning the utilities' monograph on electricity written by Mr. Brockett and circulated in schools under the name of Mrs. C. K. Tripp, who managed an industrial information bureau, the witness declared that he had no idea his name was to be stricken from the pamphlet until he saw it in print. The pamphlet was intended to be circulated without concealment of its source.

The hearing was resumed on April 16 when approximately 50 exhibits covering the publicity activities of public power utilities in several Southern and Western states were introduced. No witnesses appeared. On April 17 Senator H. C. Jones was the principal witness. The testimony of Senator Jones dealt with an investigation made in 1923 into methods used by power interests to oppose the proposed California Water and Power Act of 1922. The investigation was made by a committee of the California Senate, with Senator Jones as committee chairman.

The taking of the testimony of A. F. Hockenbeamer, president, Pacific Gas and Electric Company, and A. E. Wishon, vice-president and general manager, Great Western Power Company and San Joaquin Light & Power Corporation, and also secretary of the Light and Power Association, has been deferred until about May 1.

Judge Healy has announced that the presentation of the publicity phase of the commission's inquiry, as far as the commission's side is concerned, is almost completed, and Commissioner McCulloch has stated that soon after May 1 the public utilities may begin presenting their side of the case.

Farm Power Rate Reduction in Effect in California

Effective April 1 a new schedule reducing agricultural power rates in the territory formerly served by Coast Valleys Gas & Electric Company, Salinas, now the Coast Valleys Division of the Pacific Gas and Electric Company, has been filed with the California Railroad Commission. The cities of Monterey, Salinas, King City and the Salinas Valley will benefit by the reduction, which will amount anuually to about $45,000. The reduction is the result of informal negotiations conducted by the railroad commission, the California Farm Bureau Federation, and the Pacific Gas and Electric Company.

On the same date reduction in rates to agricultural power users also went into effect in the territories of the Southern California Edison Company and the San Joaquin Light & Power Corporation, under agreements made last year. Announcements of these agreements were published in Electrical West July 1, 1928, p. 45, and Nov. 1, 1928, p. 297.

Voters of Santa Cruz Reject Municipal Power Scheme

By a vote of 2,675 against and 1,951 for, the voters of Santa Cruz, Calif., on April 16 rejected the proposition made by the People's Construction Company of San Francisco, which had offered to build a power plant on the San Lorenzo River and transmit power to the city to be distributed by the municipality. Under the plans proposed the city would have entered into a contract to buy electric energy for a period of 40 years and at the end of that time the plant would have reverted to the city.

The community at the present time is being served by the Coast Counties Gas & Electric Company.

Recent Applications Filed With Power Commission

Recent applications filed with the Federal Power Commission for preliminary permits covering proposed power developments include the following:

By James B. Girand for permission to construct two dams and power houses on Salt River in Gila County, Ariz., affecting lands within the Fort Apache and San Carlos Indian Reservations. The first, or upper dam, just below the junction of Carrizo Creek and Salt River, will be about 325 ft. high and will develop approximately 14,000 hp. The second dam, approximately three miles downstream from the Carrizo site, will be about 140 ft. high, and will develop approximately 9,000 hp. Mr. Girand also has applied for a permit to construct a third dam in Salt River in Gila County, affecting lands within the Fort Apache Indian Reservation and the Tonto and Crook National Forests. The proposed dam is to be about 200 ft. high and will be constructed just above the mouth of Soldier Creek. A tunnel approximately 49,000 ft. long will divert the water from above the dam to a power house to be erected approximately ten miles downstream from the dam. The capacity of the plant will be approximately 8,000 hp. The power generated will be marketed among the copper mines in the vicinity.

By the City of Tacoma for permission to develop power in Mason County, Wash. The city proposes to construct a masonry-arch dam about 280 ft. high in the South Fork of Skokomish River, approximately 15 miles northwest of Shelton, Wash., and an earthen dike forming a storage reservoir with an area of about 1,800 acres, from which a tunnel approximately 3½ miles long will extend to Cushman reservoir No. 1 now operated by the city. The power thus added to the Cushman reservoir will be utilized through existing and prospective power houses of the applicant. The power capacity of the project is estimated at 39,100 hp.

By C. F. Bradford to construct a 200-ft. dam on the north fork of Consumnes River; also a 140-ft. dam on the middle fork of the river, and a power house on the north fork downstream from the dam, leading to the power house from both dams. The estimated capacity of the combined sites is 12,300 hp. The development will be situated in El Dorado County, Calif. Mr. Bradford plans to sell the power for public utility purposes.

Concentrator and Electrolytic Zinc Smelter Planned for Washington—Plans have been announced by Lewis P. Larson, of the Pend Oreille Lead-Zinc Company, Spokane, for a concentrator of 2,000 tons daily capacity and a large electrolytic zinc smelter to be built at Metaline in Pend Oreille County, Wash. It is expected that the plant will be ready to operate at least at half capacity by September of next year.

Noted Engineer Is Pacific Coast Visitor

A RECENT visitor to the Pacific Coast was Charles Edward Skinner, assistant director of engineering, Westinghouse Electric & Manufacturing Company, East Pittsburgh. While in the West Mr. Skinner spoke before meetings of the local organizations of the A.I.E.E. in San Francisco, Los Angeles, Seattle, Portland, Spokane and Salt Lake City, and addressed meetings of the San Francisco Electrical Development League, Pacific Railway Club of San Francisco, and the Los Angeles Electric Club.

C. E. SKINNER

In addressing his audiences Mr. Skinner presented demonstrations and exhibitions of materials and equipment that now are available for everyday use only through the constant development efforts of the large research laboratories. These materials include a cobalt steel which has magnetic properties heretofore impossible to obtain, insulating materials with high dielectric and heat-resisting strength and which also are used with great success in the manufacture of gears and other pieces of mechanical equipment, including airplane propellers, and metal-coated insulators designed to reduce the "static" interference from power lines. The Knowles "grid-glow" tube was demonstrated as also was the device which has popularly been dubbed the "electric eye." The grid-glow tube is one of the many by-products of radio development and is a tube very sensitive to minute electric currents, but which through its related equipment can be made to control heavy currents for special purposes. At present this equipment is used mainly for show-window and similar demonstration displays.

The photo-electric device known as the "electric eye" is another by-product of radio research. It is a vacuum tube extremely sensitive to light rays and the change in intensity of light falling upon it. In commercial application this device already is in service for counting objects or persons as they pass a given point, controlling automatically the sorting of commercial products according to their color, controlling the baking of prepared foods and many other such applications.

Light's Golden Jubilee to Be Tribute to Edison

October 21, 1929, will mark the fiftieth anniversary of the invention of the incandescent lamp by Thomas A. Edison in his laboratory at Menlo Park, N. J. During this year the electric light and power companies of America and other lands are to join in staging an elaborate celebration in every community to be featured by noteworthy electrical displays.

This series of light festivals will be formally inaugurated at Atlantic City on May 31, when dedicatory ceremonies incident to the opening of the Atlantic City Auditorium also will start and continue throughout June 1 and 2. From June 3 to 7, inclusive, the annual meeting of the National Electric Light Association will be held in the Atlantic City Auditorium when unusual lighting displays will be featured.

Edison Co.'s Attitude on Boulder Dam Expressed

The attitude of the Southern California Edison Company on the Boulder Dam project is expressed by John B. Miller, chairman of the board, in a letter mailed to the company's stockholders with a recent dividend notice. Following a brief resume of the company's status, Mr. Miller quotes an excerpt from the annual report on the Boulder Dam project. The excerpt concludes as follows:

"So far as the project affects your company's interests, it is believed that the construction of this huge enterprise, including as it does a plan to divert an enormous amount of the impounded Colorado River water into the territory served by your company, will stimulate growth and prosperity in southern California with attendant increase in demand upon the company for service. It will be your company's policy to co-operate with the Federal Government and with the other agencies now distributing power in southern California in working out plans for developing and distributing the power to the end that the project may proceed as rapidly as possible. It is unlikely, in view of the period required for construction and of the delays which apparently must ensue before construction is started, that any power will be available from the project within the next ten or twelve years. As appears previously in this report, your company is meeting with gratifying success in its present intensive efforts to enlarge the market for power in the territory it serves.

"Boulder Dam will take ten or twelve years to complete and if at that time power is developed, it will add a substantial new supply for this territory. The normal increase of your company's business during these years while the dam is under construction, will enable us to easily absorb our share of this block of power."

McGraw Award Suggestions Must Be Made by July 1

The Committee of Awards of The Society for Electrical Development, Inc., New York, directs attention to the fact that recommendations for the James H. McGraw Award for electrical men should be in the hands of the committee not later than July 1, 1929. This date covers the Wholesalers Medal, which is presented at the winter meeting of the National Electrical Wholesalers Association; the Contractor-Dealers Medal, which is presented at the annual convention of the Association of Electragists International; and the Medal for Co-operation, which is presented at a special meeting arranged by the directors of the Society for Electrical Development at an appropriate time. May 1, 1929, was the closing date for suggestions on the Manufacturers Medal, which is presented at the summer meeting of the National Elecerical Manufacturers Association.

The award for electrical men was established five years ago by James H. McGraw, chairman of the board, McGraw-Hill Publishing Company, Inc., New York, to encourage constructive thinking for the advancement of the electrical industry. Each award consists of a bronze medal and a purse of $100 in gold. The medals are given in recognition of the most important personal contributions to progress in the several branches of the industry.

Beacon Tops Water Tower

ON THE top of this water tower owned by the City of Seattle on Beacon Hill the Standard Oil Company has installed a 10,000,000-cp. aviation beacon, which may be seen in the picture atop the tower, 105 ft. from the ground.

Current for operating the beacon is supplied by the City of Seattle Lighting Department, with service from the Puget Sound Power & Light Company tied in for standby.

Kettle Falls Development Plans Being Prepared

Detailed plans for the development of the power site at Kettle Falls on the Columbia River, 90 miles north of Spokane, now are being prepared by the engineering department of The Washington Water Power Company, according to V. H. Greisser, chief engineer. Preliminary surveys were begun in January during the low water period of the Columbia River and were terminated early in March.

The data now being secured will be submitted to the Federal Power Commission before which the company has an application for a license to develop the site. At a hearing held in Spokane last February additional data were requested. It is estimated that from three to four years' work will be required for the completion of the Kettle Falls project. The development will be in ten stages, starting with a head of 25 to 40 ft., followed by a head of 50 ft. and an ultimate head of 75 ft. The first phase to be developed will be that of the minor channel, between an island and the south bank of the river, with a possible capacity of 35,000 hp. Eight generating units will be included in the finished plant. It is estimated that 260,000 hp. ultimately can be developed at the site.

City's Decision to Acquire Distributing System Raises Issue of Power Sale

WHETHER a municipality which desires to own its electrical distribution system can force a power company to supply the electrical energy for distribution is the issue which has been raised by the decision of the City of Fairfield, Calif., to acquire a municipal electrical distribution system.

In pursuance of this decision the City Council passed three resolutions: the first announced the intention of the City Council to construct and operate an electrical distributing system and ordered the adoption of plans and specifications therefor; the second ordered the construction of the first unit; the third stated that the town should apply to the California Railroad Commission for an order directing the Great Western Power Company to supply electrical energy to the town of Fairfield on its request for municipal use, and for purposes of resale to the inhabitants of Fairfield over a municipally owned electrical distributing system, and for an order fixing the rates to be paid by the town.

Under the plan adopted the city will construct as its first unit approximately 3,000 ft. of transmission line for the purpose of taking on some of the municipal load, and in building the line will take on in addition some private consumers. After this service has been established, the city will apply to the railroad commission for the orders mentioned in the third resolution.

The Great Western Power Company, which now is serving the community, has announced that it will not sell its distribution system except under condemnation proceedings; that if the municipality erects its own distribution system, the company will not retire but will remain and continue in competition with the municipal system; and that its attorneys have taken the position that the company is not required to sell the city current to be used in competition with itself. This policy was adopted early in the year as a matter of joint agreement with the Pacific Gas and Electric Company, which also serves the town of Fairfield. (Electrical West, Jan. 1, 1929, p. 49.)

Louis Bartlett, former mayor of Berkeley, a former clerk of the California League of Municipalities, and one of the organizers of the East Bay Municipal Utility District, has been employed by the City of Fairfield as its legal representative.

West Canadian Company Has Been Reorganized

The West Canadian Hydro-Electric Corporation of Vernon, B.C., has been reorganized and now is controlled by R. E. Wilsey & Company, Inc., of Chicago and Los Angeles, according to the announcement of A. C. R. Yuill, who has been appointed consulting engineer and manager of the re-organized company.

The work of completing hydro-electric development at Shuswap Falls is proceeding under the direction of Mr. Yuill. From this development the company will serve the North Okanagan district, including Vernon, Armstrong, Enderby, Salmon Arm and Lumby. Under the revised program it is expected that energy from the hydro-electric station will be delivered in Vernon by June 1 and in other municipalities by July 1.

Capacity of El Paso Steam Plant to Be 40,000 Kw.

When completed, the new steam plant now being constructed by the El Paso Electric Company, El Paso, Texas, plans for which were announced in Electrical West, April 1, p. 237, will have a total capacity of 40,000 kw.

The company states that a new 25,000-kw. unit is to be installed in the new Rio Grande plant and as soon as the installation of that unit has been completed a 15,000-kw. unit will be removed from the present power plant. The old plant then will be used for stand-by service.

Deadwood Dam Near Boise for Power Development

Plans for construction of the Deadwood dam have been announced by the U.S. Reclamation Bureau. The dam will be situated on the Deadwood River, a branch of the Payette, about 50 miles north of Boise, Idaho, and will form a reservoir with capacity of 150,000 acre-ft. This storage will ultimately be required for the proposed Payette division of the Boise project. The Bureau states, however, that its immediate requirement, pending the completion of the Owyhee project, will be storage for power development at the Boise project's Black Canyon power plant. The power is needed by the Gem irrigation districts where 30,000 acres of old developed land, which will ultimately have a gravity water supply from the Owyhee project, are dependent on a pumped water supply.

The cost of the dam, as well as the Black Canyon power plant, it is hoped, will be repaid from the power revenues of the next fifteen years. The dam will be of concrete arch design, 600 ft. long and 160 ft. maximum height. Its estimated cost is $1,200,000 and two summer seasons will be required for its completion. Bids are to be called for during the present fiscal year.

854 Red Seal Homes in First Quarter of 1929

During the first quarter of 1929 applications were received by the California Electrical Bureau for 854 Red Seal homes. This amounts to 44 per cent of the total quota of 1,930 set for the year. The bureau has furnished the following tabulation which shows clearly the rising curve of Red Seal results:

	Quota	Homes	Per Cent of Quota Achieved
1926....	655	723	110
1927....	800	896	112
1928....	1120	1749	156
1929....	1930	854—3 months	44

Colorado Electrical League Reports 1928 Activities

As a result of the field work and related activities of the Electrical League of Colorado, Denver, the league's annual report shows the addition of 6,827 outlets during the year 1928. Of this number, 4,433 have been installed on 346 completed jobs, the remainder being additions to work contracted for or actually under construction, but not completed at the close of the year. The total additions for 1927 amounted to 6,094, or an increase for 1928 of 733 outlets.

During the past year the league received 177 Red Seal applications. Forty-eight certificates were issued covering twenty residences, an apartment house of sixteen suites, and a second apartment house of twelve suites. In 127 Red Seal installations on which the league's staff worked 43 increased the number of outlets from 51 per cent to 100 per cent over the original layout; 40 increased from 26 per cent to 50 per cent; 24 increased from 15 per cent to 25 per cent; and 20 increased from 3 per cent to 14 per cent over the original layout. The average increase in outlets over original layouts was 37 per cent. The total number of outlets added to these 127 installations amounted to 2,291, an average outlet addition per installation of 19.

A Trophy for Prowess at Golf

ADDISON B. DAY, president, Los Angeles Gas and Electric Corporation, has presented to the company's employees' association this silver cup to be known as the "President's Perpetual Golf Team Trophy." The cup stands 31 in. high and bears the engraved emblem of the employees' association. It will be competed for twice a year by ten-men teams representing the general offices and the gas and electric departments.

California - Oregon and Mountain States Companies Plan Interconnection—Plans are under way to build a transmission line from Dixonville to Marshfield, Ore., for the purpose of interchange of power between the California Oregon Power Company's system and the Marshfield division of the Mountain States Power Company, according to an announcement by Halford Erickson, vice-president in charge of operation, Byllesby Engineering & Management Corporation. The line is expected to be ready for service by August.

Contract Let for Re-location of Stave Railway at Ruskin Project—Contract for the re-location of the Stave Railway in connection with the B. C. Electric Railway Company's hydro-electric power project at Ruskin, B. C., has been let to the Ellis Cotton Company on a bid of $134,736. The contract calls for the construction of 3½ miles of roadbed above the level of the lake which will be formed when the dam is completed. This will take the place of a stretch of line which will be submerged. With complete electrification the stretch of railway will cost approximately $250,000 and is to be completed by Sept. 15.

Bill to Tax Electric Energy Sold Filed With Washington Legislature—All electric energy sold in the State of Washington would be subject to an excise tax of one mill for each kilowatt-hour under a bill filed by J. W. Shipley, Skamania County, with the State Legislature. The measure would provide that each electric company, municipal or private, furnish the director of licenses by the fifteenth of each month a sworn statement of the number of kilowatt-hours of electricity sold. Each company would be required to pay the tax by the fifteenth of the month. Electric energy exported for sale in other states would not be taxed.

Civil Service Announces Examinations for Electrical Engineers—The U. S. Civil Service Commission has announced competitive examinations to be held for associate electrical engineer, assistant electrical engineer and junior electrical engineer. Entrance salaries are $3,200, $2,600 and $2,000 a year, respectively. Applications for the first two examinations must be on file with the commission at Washington, D. C., not later than May 29 and for the third not later than May 21. Full information may be obtained from the commission at Washington, D. C., or at the post office or customs house in any city.

City of Pasadena to Acquire Addition to Electrical Distributing System—Permission has been granted by the California Railroad Commission to the Southern California Edison Company to sell to the City of Pasadena that portion of its electrical distributing system in Eaton Canyon Addition for the sum of $32,312.29.

Citizens of Prince Rupert, B. C., Vote to Sell Municipal Plant to Power Company—On March 1 by a vote of 583 to 80 the citizens of Prince Rupert, B. C., decided to transfer the city's hydro-electric plant and lighting franchise to the Power Corporation of Canada for $375,000. The power company has agreed to start work immediately on the extension of the power plant at a cost of not less than $1,000,000.

Power Project Planned in Skamania County, Wash.

Application has been filed by George McCoy, Vancouver, Wash., with the Washington Hydraulics Office for the right to divert 125 sec.-ft. of water from Swift Creek at its junction with the Lewis River, approximately 28 miles northeast of Stevenson, Skamania County, Wash.

The water will be used in connection with a hydro-electric power project to develop approximately 12,000 hp. at an estimated cost of $900,000. Plans include a flume 2¾ miles long and a timber crib diversion dam 20 ft. high with a width of 100 ft. at the top and 50 ft. at the bottom.

FINANCIAL NEWS

Pacific Gas and Electric Company Increases Gross Revenue $3,392,267 in 1928

THE uninterrupted growth which has marked the Pacific Gas and Electric Company's progress since its organization was continued last year, the 1928 gross revenue of $61,788,079 being $3,392,267 in excess of the corresponding figure in 1927, according to E. J. Beckett, assistant treasurer. Approximately two-thirds of the increased gross was converted to net, which increased $2,229,907.

Following is a summarized statement of the consolidated income account of the company and its wholly owned subsidiaries, as reported to stockholders at the annual meeting held on April 9:

	Year 1928	Increase Over 1927
Gross revenue, including miscellaneous income	$61,788,079	$ 3,392,267
Operating expenses, including federal and other taxes	31,759,205	1,162,360
Net income	$30,028,874	$ 2,229,907
Bond interest and discount	$10,659,216	$ *375,156
Depreciation reserve	5,967,320	588,775
Surplus	$13,402,338	$ 2,016,288
Dividends on preferred stock (6 per cent)	$ 4,601,630	$ 216,772
Dividends on common stock (8 per cent)	5,550,574	658,222
Balance	3,250,134	1,141,294

* Decrease.

The bond refunding operations which were conducted in September, 1927, and February, 1928, resulted in lower fixed charges, bond interest and discount in 1928 being $375,156 less than in the preceding year.

The balance available for common stock dividends was $8,800,708, equivalent to $3.17 per share on the average common outstanding during the year, and to $3.05 per share on the total common outstanding or subscribed for on Dec. 31, 1928.

After the payment of dividends, there was carried to undistributed surplus a balance of $3,250,134, or $1,141,294 in excess of the preceding year.

The increasing surplus available for dividend payments has been accompanied by substantial reductions in the cost of service to our patrons. Since 1920 three major reductions have been made in electric rates, representing, on the basis of present business, an aggregate saving to our electric customers exceeding $10,000,000 annually. This is equivalent to almost twice the present annual dividends upon the outstanding common stock. In addition, several adjustments of gas rates in conformity with the practice established by the California Railroad Commission in 1921 of raising or lowering schedules to conform to fluctuations in fuel oil prices, resulted in net decreases during this period varying from 13 cents to 23 cents per 1,000 cu.ft. of gas. The aggregate of these reductions in gas rates represents an additional saving to our customers of several millions of dollars per annum.

It is gratifying to the management that the company's steadily strengthening financial position has been achieved with equally beneficial results to the owners of the company and to its customers. An important contributing factor, aside from the obvious advantages of a larger business volume, technical improvements in production and distribution, smaller average overhead, and decreasing cost of capital has been the conservative policy pursued for many years of reinvesting in the business a portion of annual earnings.

A condensed consolidated balance sheet as of Dec. 31, 1928, follows:

ASSETS		
Plants and properties		$375,585,886
Discount and expense on capital stock		9,284,634
Investments		230,628
Trustees of sinking funds, exclusive of company bonds in sinking funds		330,531
Current assets:		
Cash	$ 6,069,500	
Other current assets	12,823,120	18,892,620
Deferred charges		9,593,780
Total assets		$413,918,079
LIABILITIES		
Preferred stock	$78,892,907	
Common stock	72,142,340	$151,035,247
Capital stock of subsidiary companies not held by Pacific Gas and Electric Co.		50,056
Funded debt		207,883,000
Current liabilities		13,614,690
Depreciation and other reserves		25,806,762
Surplus		15,528,324
Total liabilities		$413,918,079

The ownership of the company on Dec. 31, 1928, was vested in 49,068 stockholders, of whom upwards of four-fifths are residents of California. It is interesting to note the increasing preponderance of women over men stockholders, there now being on our stockholders' registers 20,975 of the former and 19,592 of the latter, in addition to 7,557 joint tenancies (usually husband and wife) and 929 associations, insurance companies and similar institutions.

The number of customers connected to the company's lines on Dec. 31 aggregated $1,004,340, an increase of 36,623.

All of the former directors and officers of the company were re-elected.

Nevada-California Corp. Offers Stock at $107

For the first time in its history The Nevada-California Electric Corporation is offering its preferred stock for sale to its customers. The stock is 7 per cent non-callable cumulative preferred and is being sold at $107 per share. It has behind it all of the assets of the group of associated subsidiary companies of The Nevada-California Electric Corporation, which includes The Southern Sierras Power Company, The Nevada - California Power Company, Yuma Utilities Company, The Imperial Ice and Development Company, Hillside Water Company, Cain Irrigation Company and Interstate Telegraph Company. The total assets represented by these different companies amount to nearly $50,000,000, as shown in the annual reports to stockholders.

The different types of activities carried on by this group of companies and the large number of diverse industries that are served result in a variety of service that is one of the strongest talking points on the desirability of the stock, the company points out, on account of the fact that the failure of any one industry does not affect the entire system seriously.

Washington Company Buys Three Idaho Properties

Effective May 1, The Washington Water Power Company, Spokane, has purchased the Kootenai Power Company, the Consumers Water Company and the Inland Sales Company, all of Coeur d'Alene, Idaho. The three properties have an estimated aggregate value of $1,000,000. The light and power accounts total 4,000.

In the deal The Washington Water Power Company has acquired all the capital stock of the three companies which serve Coeur d'Alene and the immediate vicinity. The Inland Sales Company is an electrical merchandising organization.

The principal ownership of the three purchased companies was vested in the estate of the late August Paulsen, Spokane capitalist. Other associates were Stanley Easton, of Coeur d'Alene; Harry Day, Wallace, Idaho; R. M. Crommelin; S. B. Merrill; Mrs. Myrtle Paulsen; Clarence Paulsen; and George Harding, of Spokane.

Pacific Coast Electrical Association

Successful Convention Held in Tucson by Arizona Utilities Association

MORE than 100 men and women gathered in Tucson, April 4-6, to attend the fourth annual convention of the Arizona Utilities Association, held jointly with the Pacific Coast Electrical Association and the Pacific Coast Gas Association at El Conquistador Hotel.

The convention was opened by M. A. Pooler, president of the Arizona Utilities Association, and vice-president and general manager, Tucson Gas, Electric Light & Power Company.

The principal address of the opening day was delivered by Paul M. Downing of San Francisco, president, P.C.E.A., and vice-president, Pacific Gas and Electric Company, in charge of operation. Referring to the past record of the electrical industry, Mr. Downing said that a "good part of this success has been made in the face of opposition. . . . .In 47 out of 48 states rates, capitalization, accounting, service, etc., are regulated by public authority, and yet some newspapers have adopted the practice of singling out the so-called 'power trust' for attack every time the newspaper management feels it would be advantageous to pose as the champion of the public."

Mr. Downing pointed out that the electrical industry is facing a critical period. "In view of the unrest and the agitation that is going on," he declared, "there is a great responsibility resting upon management to determine by its acts whether the industry shall continue on its course, normally and properly, or whether those who at the moment are attempting to discover evils to present to the public are to receive encouragement from some who may adopt unwise policies and unfair methods. The public will not be governed by what we say but by what we do. It expects results and will not be satisfied with promises."

The speaker referred briefly to the investigation of the electrical industries being carried on by the Federal Trade Commission at Washington. "It is unnecessary," he said, "to say that the industry, as a whole, has nothing to fear from this investigation, but will welcome any non-political, fact-finding investigation however far reaching it may be."

Other speakers on the opening day included E. B. Chase, illuminating engineer with the National Lamp Works of the General Electric Company, Oakland, Calif., who discussed "Light, the Business Getter"; Capt. A. E. Higgins, field representative, American Gas Association; and George Lewis, representing the Rocky Mountain Committee on Public Utility Information, Denver. In discussing the subject, "Still Again—Why all the Secrecy?" Mr. Lewis appealed to all those present to return to their respective companies and pass on to their co-workers the information they had gathered at this meeting, declaring too little of this practice was in vogue, and thus many convention trips by officials and heads of departments became practically useless so far as any general good to their companies was concerned.

The remainder of the opening day was given over to a "get acquainted luncheon," bridge tea for the ladies at the home of Mrs. M. A. Pooler, and the banquet in the evening.

The second day's program was taken up with the reading of essays entered in the contest for prizes offered by the P.C.E.A. The first prize was won by Wilma Jones and Irene Wolcott, Arizona Edison Company, Bisbee, for their essay on "Employees and Customers' Relations"; the second prize by Claude H. Webber, Tucson Gas, Electric Light & Power Company, for his essay entitled "Better Public Relations Through Association Work"; and the third prize by Jack Arnold, Central Arizona Light & Power Company, Phoenix, for his essay, "Telling the Story." The first and second prize winners will be given a trip to the annual convention of the Pacific Coast Electrical Association to be held at Del Monte, Calif., in June.

Mrs. Ruth E. Creveling, chairman, women's committee, Public Relations Section, P.C.E.A., San Diego, discussed "Feminism in the Public Utility Field."

In the afternoon a golf tournament was held at the Tucson Golf and Country Club. Mr. Downing won the perpetual loving cup offered in the men's tournament, and Mrs. Downing won first prize in the women's putting contest.

In attendance at the Tucson convention of the Arizona Utilities Association were those in this group gathered in front of El Conquistador Hotel. Left to right, seated, they are Captain A. E. Higgins, field representative, American Gas Association; Mrs. Ruth E. Creveling, chairman, women's committee, Public Relations Section, Pacific Coast Electrical Association; Mrs. P. M. Downing; P. M. Downing, president, Pacific Coast Electrical Association. Standing: Clifford Johnstone, secretary, Pacific Coast Gas Association, and G. E. Lewis, director of public utilities information for Colorado, New Mexico and Wyoming.

The proceedings on the third day consisted of the annual report of the secretary of the association, L. C. McCullough, the election of officers, and a paper by C. H. Potter, commercial manager, Southern Counties Gas Company, Los Angeles, on "Progress in Gas Sales."

The officers elected for the ensuing year follow: president—L. V. Seares, vice-president and general manager, Arizona Power Company, Prescott; first vice-president—A. F. Morairty, assistant general manager, Central Arizona Light & Power Company, Phoenix; second vice-president—M. G. Sanders, commercial manager, Arizona Edison Company, Phoenix; secretary-treasurer—L. C. McCullough, secretary, Arizona Industrial Congress, Phoenix.

It was decided that the 1930 convention would be held in Phoenix, the date to be selected later.

At the end of the business session on the last day all delegates and visitors were transported 60 miles south of Tucson to Hacienda de la Arivaca on the Mexican border where a special rodeo and Mexican entertainment were provided.

Entries in Red Seal Essay Contest Number 1,209

L. J. Brundige, chairman, Employee Essay Contest, PC.E.A., has announced that 1,209 essays on the subect, "Why I Would Like to Own a Red Seal Home," have been entered in the contest. The companies represented and the number of essays submitted from each one are given below:

Tucson Gas & Electric Company	3
Southern California Edison Company	910
Coast Counties Gas & Electric Company	22
Los Angeles Gas and Electric Corporation	104
San Diego Consolidated Gas & Electric Company	20
Pacific Gas and Electric Company	60
Great Western Power Company	25
San Joaquin Light & Power Corporation	44
The Southern Sierras Power Company	16
Central Arizona Light & Power Company	3
Sierra Pacific Power Company	2
Total	1,209

Engineering Section Convenes at Fresno and Plans for June Convention

CLOSING the current year's work and laying preliminary plans for next year's activities, the Engineering Section, P.C.E.A., held its usual three-day conclave in Fresno April 17-19.

In addition to other work accomplished, plans were made for the participation of the Engineering Section in the forthcoming P.C.E.A. convention at Del Monte. It is contemplated that four or five of the features of the general convention program will be supplied through the activities of the Engineering Section.

The Fresno meetings afforded the initial opportunity to try out the section's new scheme of so programming the three-day conclave that there were no two-day committee sessions. This scheme reduced the number of parallel sessions and consequently made it possible for individuals to attend more of the different committee sessions, although it practically cut in half the usual time allotment of some of the committees.

Brief outlines of the activities of the various committees follow:

Accident Prevention Committee

F. S. THOMAS
Coast Counties Gas & Electric Company, Chairman.

The accident prevention committee held a spirited and interesting session. W. H. Talbot, who represented the chairman at the Memphis meeting of the N.E.L.A., reported on that meeting. W. E. Richmond reported on progress made in the compilation of a "Standard National First Aid Manual," this work to be carried over into next year. The following papers were presented for discussion and adoption: "Poison Oak Preventives and Remedies," J. M. Buswell; "Wireless Aerial-Power Line Hazards," S. G. Olson; "Unusual Accidents," J. M. Buswell; "Compilation of Accident Statistics and Uniform Reports," J. R. Rowe.

Electrical Apparatus Committee

H. T. SUTCLIFFE
Pacific Gas and Electric Company, Chairman.

Final reports for the year were made by the subcommittee on lightning arresters, automatic substations, and transformers and regulators. The utilization equipment subcommittee presented a recommendation relative to a proposed increase in the permitted values of blocked rotor current for certain larger sizes of line start induction motors. This subject now being under discussion between the N.E.L.A. and N.E.M.A., it was thought advisable to adopt a definite policy in the matter, and approval was given to setting a tentative limit of 25 per cent over present N.E.L.A. values governing motors of the larger sizes.

The following subjects were selected for study during the next year: Transformers, control circuits and apparatus, operating experiences with the synchronous condenser, and utilization equipment.

A complete single-pole Deion circuit breaker was exhibited at the meeting by J. B. MacNeill, manager of the circuit breaker engineering department, Westinghouse Electric & Manufacturing Company.

Hydraulic Power Committee

HAROLD K. FOX
San Joaquin Light & Power Corporation, Chairman.

The first subject on the program, "Mechanical Reliability of Hydro-Electric Plants," was reported on by E. A. Crellin. Discussion brought forth the unanimous opinion that this report should be continued for another five years, at least, as the results would become more and more valuable with the increased length of the record. It was suggested that the scope of this report be enlarged to include cost data in order to develop the economical side of outages. There was a difference of opinion as to the possibility of obtaining authentic data and the subject was left for future determination.

Considerable time was given at this meeting to a report on flow line conduits.

Other reports presented included those on penstocks, hydraulic plant operating problems, use of concrete in hydraulic structures, research in hydro-electric development, and silting of reservoirs.

A. H. Markwart, vice-president, Pacific Gas and Electric Company, presented the subject, "Combined Hydro and Steam Generation." Because of the recent ascendency of steam much interested discussion on the subject followed Mr. Markwart's talk.

Inductive Co-ordination Committee

E. Y. PORTER
The Southern Sierras Power Company, Chairman.

A report of the Memphis meeting of the N.E.L.A. inductive co-ordination committee was made. Attention was called to a case in Illinois where the telephone company had asked for rerouting of a 44-kv. line which paralleled a proposed underground telephone toll cable for a distance of two miles. Question was raised as to the inductive effect on underground telephone cables under such conditions. It was pointed out by members of the Pacific Telephone and Telegraph Company that while underground communication cables in urban areas were usually almost immune from inductive interference due to shielding of meter and gas pipe networks, it was possible in rural districts in case of direct parallels to get considerable induced voltage in the telephone cable conductors under short circuit or other disturbances in the overhead power lines. Reports to the N.E.L.A. committee show that a large proportion of the radio interference caused by distribution circuits were traceable to street light circuits.

A report on standardization of power company communication systems indicated that it did not seem feasible at this time to go far towards standardization because of the wide diversity of conditions and difference in the attitude of the management of the several power companies towards their respective communication systems. The report, however, called attention to the urgent need of certain devices and equipment better adapted to the needs of power company communication service, especially with reference to better insulation of switching and relay equipment.

Discussion centered largely around the feasibility of such service being rendered largely or wholly by established communication companies instead of by special plants and departments of the power companies. The consensus of opinion seemed to be that there were certain features of power company operating requirements which made it impracticable to tie operating and load dispatching communication circuits into or operate them through public exchange channels.

In the report of the subcommittee on radio co-ordination and complaints the system in effect in the San Francisco Bay district was described, where all such complaints are referred to a clearing house operated by the Radio Dealers Association. Competent investigators are sent out and if it is found that the trouble is caused by a utility company operating in the district, the utility is notified and takes the proper steps to correct the trouble, if possible. It was shown that the utilities and radio dealers in Los Angeles and vicinity are co-operating in a somewhat different manner with good results.

The afternoon session was devoted to a discussion of the technical features involved in the joint study of a common neutral. The trial practices agreed upon by this subcommittee and the power and communication interests involved had been reported at a joint meeting of the overhead systems and inductive co-ordination committees. These practices have been submitted to the Railroad Commission for its consideration and issue of regulations under which common neutral installations may be made. A lively discussion centered around the restrictions proposed in the practices relative to the wave form of generators. The common neutral study occupied nearly a year of exhaustive study, participated in by members of the P.C.E.A. and representatives from the N.E.L.A. headquarters office, the Pacific Telephone and Telegraph Company, American Telephone and Telegraph Company and Independent Telephone Association.

Meter Committee

L. L. CONRAD
Southern California Edison Company, Chairman.

The program of the meter committee included the presentation of reports of subcommittee activities occurring since the January meeting.

It was reported that under the supervision of the education of metermen subcommittee two 1929 annual short courses for metermen had been conducted to date: one at the California Institute of Technology at Pasadena with an enrollment of 44 students, and the other at the University of Arizona, Tucson, with an enrollment of 22 men and 1 woman. The program for the course at the University of California at Brekeley to be held in May is complete.

Several manufacturers' products relating to meters and metering practices were presented, as well as a number of refinements developed by the power companies.

Further agreements were reached relative to the adoption of standard methods and the acceptance of suitable devices to be recommended as approved testing facilities. A motion picture, "Meter Department Activities," belonging to the San Diego Consolidated gas & Electric Company, was shown.

Other subcommittees reporting were those on clocks and timing devices, meter statistics, special metering, special tests and investigations, uniform regulations and high voltage installations.

Overhead Systems Committee

R. G. BOYLES
Southern California Edison Company, Chairman.

A report of a study made of transformer loading indicated that in general more transformer capacity than is necessary has been installed where the load is made up of cooking, heating and lighting. The determining factor seems to be transformer regulation rather than load. Further study is to be given to this subject.

The study of pole line construction tools has resulted in some valuable recommendations being made, which include two sets of suggested specifications, one covering ladders and another pike poles.

The subcommittee on pole line structures and devices submitted a report covering the following subjects: (1) fuses, fuse tubes, cut-outs and oil switches; (2) care of poles and cross-arms; (3) maintenance of distribution transformers; (4) conductor spacing; (5) overhead cables and tree wire construction.

The subject of fuses was discussed at some length and it was recommended that the manufacturer be asked to give his fuses a rating which would indicate the constant load that the fuse would carry without damage, and also furnish a curve showing the blowing point of each fuse.

The subcommittee on joint pole practices and construction rules reported that General Order No. 64-A of the California Railroad Commission was completed and made effective March 1, 1929. This committee urges that some standard pole specification be written which will assist the joint pole committee in its work.

In a report on methods of securing satisfactory grounds it was shown that the most satisfactory grounds in general are the grounds secured by the use of the water system. Driven grounds in a great many instances have high resistance and as a rule are not entirely satisfactory.

Corrosion of metals in line construction was discussed and it was reported that galvanizing specifications had been written and are now being used by one company for steel tower work, but the committee is not ready to recommend this specification as entirely satisfactory.

The joint subcommittee on common primary and secondary neutral submitted a very gratifying report. This subject has been studied for the past two years and has entailed a great deal of work. The committee reports that an agreement has been reached and that a set of trial practices has been written and submitted to the Railroad Commission for approval.

The subcommittee on the National Electric Code made a short report. Some difficulty is experienced in this work as General Order 64-A does not permit certain practices which are approved in the national code.

Prime Movers Committee

F. R. KNIGHT
Los Angeles Gas and Electric Corporation, Chairman.

Final reports were made at the prime movers committee meeting by six subcommittees followed by animated discussion on each subject. An abstract of minutes of similar committees in other geographic divisions was read, and subjects chosen for study by the committee during the coming year.

Underground Systems Committee

K. B. AYRES
San Diego Consolidated Gas & Electric Company, Chairman

A resume of the meeting of the underground systems committee, N.E.L.A., held in Memphis, was given detailing the subjects under consideration and progress being made in the studies by that body.

Other subjects given detailed study at the Fresno meeting included: Engineering aspects of use of lower loss transformers in underground systems instead of ventilating transformer manholes and vaults; improvement of underground disconnecting switches toward the development of less hazardous installations; automatic versus manual transfer of load between circuits; methods of installing small sized subway transformers to prevent submersion; training of underground force, mechanical, electrical, safety, etc.; splicers' equipment, tools and devices; underground equipment, miscellaneous apparatus, and safety devices; standardization of cable reels; identification of cables in manholes and vaults; and provision of vault space for street light transformers.

Essay Contest Announced by Women's Committee

Mrs. Ruth E. Creveling, chairman, women's committee, Public Relations Section, Pacific Coast Electrical Association, has announced that that committee is sponsoring an essay contest open to all members of women's committees in public utilities affiliated with the Pacific Coast Electrical Association. The subject of the essay is, "The Women's Committee—An Asset to the Utility." Manuscripts are to be submitted to the chairman of each local committtee who will forward them to Mrs. Creveling on May 15, the closing date of the contest.

Three prizes, $50, $25, and $10, respectively, are offered. In addition three essays will receive honorable mention together with a $5 cash prize each.

Arizona Women's Committee Chairman Appointed

MRS. JEAN ROBERTS, home economics instructor for the Tucson Gas, Electric Light & Power Company, has been appointed the first state chairman of the women's committee, P.C.E.A., in Arizona. Mrs. Roberts has been actively identified with the women's committee in California for the past two years. Although until very recently Arizona has had no women's committee of its own, the

MRS. JEAN ROBERTS

utilities of the state now are evidencing a keen appreciation of the value of women employees and committees are being organized in five leading cities.

Northwest Electric Light & Power Association

Northwest Convention Plans Feature Victoria Trip

Delegates and visitors to the convention of the Northwest Electric Light and Power Association at Seattle, June 26-29, 1929, will be treated to a trip to Victoria as a combined business and

C. R. Wallis, who is general chairman of the convention of the Northwest Electric Light and Power Association, to be held in Seattle in June.

entertainment feature, if tentative plans of the convention committee, headed by C. R. Wallis, General Electric Company, Seattle, are carried to completion. As now scheduled, a boat of sufficient size to carry the entire convention will leave Seattle in the morning, and during the four-hour trip across the sound will house one of the business sessions. The afternoon at Victoria will be left open for the indulgence of the pleasures and whims of the individual delegates, but arrangements will be made for trips, for those who desire to take them, to the many points of interest in the vicinity of the city. The return trip will be made early in the evening to accommodate those that may desire to take night trains from Seattle for the East and South.

The convention is to open Wednesday morning, June 26. Business sessions will be held both in the morning and afternoon, and the usual president's reception will take place that evening. Thursday is scheduled for the third session in the morning and the annual golf tournament at the Sand Point Golf Club in the afternoon, with an informal dinner and entertainment in the evening. Special entertainment features for the ladies are scheduled for Wednesday and Thursday. The Victoria trip, with the fourth business session on the boat, is scheduled for Friday, June 28.

At the time of going to press, M. T. Crawford, Puget Sound Power & Light Company, chairman of the program committee, could release no announcement of names of speakers who would appear at the business sessions, beyond the fact that the usual coterie of N.E.L.A. officials, headed by M. S. Sloan of the New York Edison Company, who will then be the new president-elect, will be present. Several speakers of national reputation, however, both from within and without the industry, have been invited, and it is certain that the usual high standard of Northwest convention programs will be maintained. One of the features of the program of the Public Relations Section will be the finals in two public speaking contests, in which the winners from each company will compete for the Northwest prize, as was done in last year's final contest, which proved to be such an interesting feature of that convention.

Engineers' Section Conclave Reveals Developments of Practical Worth

WITH one or more subjects of intense interest to operating and construction engineers presented under each committee's program, and with more time allowed for informal discussion than heretofore, the sixth annual general meeting of the Engineering Section, Northwest Electric Light and Power Association, held at Walla Walla, Wash., March 25-27, recorded one of the most practical and useful meetings of its history. One hundred and fifty delegates registered at the headquarters in the Marcus Whitman Hotel. The local personnel of the Pacific Power & Light Company acted as hosts and hostesses, looked after the comfort of the delegates, provided excellent entertainment at the banquet on the last night of the meeting, and conducted a trip to view the company's hydro-electric development at Lewiston, Idaho, on March 28.

After welcome by R. B. Bragg, R. M. Boykin, president of the association, responded, calling attention to the apparent lack of a rounded-out education among the engineering students from some of the universities in the territory. C. Rea Moore, department of public works, Olympia, Wash., enumerated the steps in expansion of the scope of the department's jurisdiction, and said that of 116 public hearings on utility questions in the state in 1928 only four were on electric utility matters. H. S. Bennion, director of engineering, N.E.L.A., told of the current work of the engineering department of national headquarters in attempting to co-operate with manufacturers, other utilities, code-making bodies, and other agencies in solving the many problems of national scope that arose to affect the inter-relation of these agencies. A non-technical interlude of great interest was furnished in an address by Dr. S. B. L. Penrose, president, Whitman College, Walla Walla.

A summary of the papers presented and the discussions thereon follows:

Accident Prevention Committee

JOHN B. FISKEN

The Washington Water Power Company, Spokane, Chairman

Introducing the subjects to be presented by his committee, Mr. Fisken called attention to points of contact between accident prevention work and commercial and public relations activities of the companies. G. L. Knotts, E. I. DuPont de Nemours Company, urged that education on accident prevention and first aid be carried into the home.

Classing 20 per cent of industrial accidents as non-preventable and generally traceable to failure of mental and physical co-ordination of some individual, Wallace Brier suggested that the following four practices be followed: (1) Employ foremen who will take a personal interest in each of his men and gain their confidence. (2) Give mental and physical examinations to establish the individual's fitness for his job. (3) Place men found to have major or minor defects in positions where their defects will not create a hazard. (4) Allow no individual who is mentally or physically sick to work.

A survey among the meter departments of fourteen Northwest companies, reported by J. C. Henkle, undertook to determine to what extent safety first was taught and practiced by metermen, what protective devices and inspection of equipment were provided, and what had been the number, nature and seriousness of accidents to metermen. A wide variety of practice was recorded.

Electrical Apparatus Committee

E. F. PEARSON

Northwestern Electric Company, Portland, Chairman

A paper by A. L. Harding, Electric Bond & Share Company, New York, read in his absence by John Bankus, sketched the history of attempts at standardization of voltages and progress made, and listed the present suggestions for preferred voltages within different transmission and distribution classes. It was pointed out that increasing loads had forced some systems to maintain higher bus voltages to keep the voltage at the point of utilization normal, which forced over-excitation of generator and transformer equipment. The joint committee had recommended that no change be made in transformer ratios as had been suggested as a remedy, but that transformers be re-rated at an increase of 5 per cent in primary and secondary ratings, keeping the ratio the same as formerly. Discussion centered around the proper utilization voltage to maintain, and brought out that saturation of ranges had a marked effect on the problem of delivering fairly constant service to the customer. The evil of over-excitation of equipment was stressed.

Some new developments in Westinghouse and General Electric apparatus were discussed in papers by C. E. Carey and C. W. Fick, respectively. All-steel switchboards, condenser bushing-type potential devices, oscillograph equipment, umbrella-type generators and the "Deion" circuit breaker were described with slides by Mr. Carey, while Mr. Fick discussed hydrogen-cooled synchronous condensers, the double winding generator, and high-speed excitation.

Hydraulic Power Committee

E. H. COLLINS

The Washington Water Power Company, Spokane,Chairman

A complete analysis of the fish and dam problem in the Northwest, with particular reference to the progress of experiments made on fishways, mechanical lifts and electric fish screens, was presented by J. E. Yates. Some important conclusions were that fish culturists would resist projects on fishing streams until convinced that biological life can flourish under the conditions imposed; that fishways over low dams have been successful but their workability at greater heights is not proved; that some mechanical lifts have proved effective in experiments; that the electric fish screen shows promise of being useful in predetermining paths both upstream and downstream for the migrating fish; that much experimenting with this and other devices needs to be done before the limitations of the fishway problem can be defined. Supplementing this report, F. O. McMillan of the Oregon State College told of securing by experiment some data of a fundamental nature on the effect on fish of an electric field in water, in which it was found among other facts that the amount of voltage necessary to paralyze was inversely proportional to the length of the fish.

The problem of minimizing leakage of water past the runner and also along the shafts of waterwheels was discussed by J. H. Siegfried. The application of a motor-driven Alemite grease gun was effective in stopping the leak and preventing the scoring of the seal ring in one installation which increased the economic capacity of the generator from 6,000 to 6,300 kw. The application of Rain's metallic packing has been effective in another installation.

Stating that the problem of frequency regulation had been complicated by the use of synchronous motor-driven clocks on the systems of companies and by additional burdens imposed by interconnection, A. N. Geyer described the application of a mechanism attached to a governor by which regulation of the speed of the wheel was controlled under load swings to a value of one-third of 1 per cent. In discussion, C. W. Fick explained the new Warren automatic frequency controller. Charts illustrating the operation of Woodward governors were also shown, and opinion was expressed that equalization should be accomplished electrically instead of mechanically.

Inductive Co-ordination Committee

G. E. QUINAN

Puget Sound Power & Light Company, Seattle, Chairman

The interference caused by corona and brush discharge on suspension and pin-type insulators was announced by the chairman as a subject for discussion and demonstration. E. L. White told of line interference trouble leading to the discovery that clevis-type suspension insulators were more "noisy" than the ball and socket type, and of subsequent experiments indicating that there was an audible discharge on the clevis type under normal operating conditions. In a study of pin-type insulators Ellis Van Atta told of tracing the noise to oscillatory discharges between pin and insulator or between conductor and insulator, the problem in eliminating the noise being to overcome resistance to the flow of charging current into the insulator.

Among remedial measures tried in practice that were demonstrated were: (1) the use of copper wire mesh under the tie wire and conductor, (2) metallic caps cemented to the top of the insulator, (3) metallic paint and plating, (4) metal plates on top of the conductor over the insulator, and (5) the introduction of several additional turns of tie wire in the tie groove and the conductor groove. The general conclusion was that the complete solution had not been reached and that more experimentation was necessary.

Meter Committee

A. H. KREUL

Portland Electric Power Company, Portland, Chairman

With the problem of registering all the kw.-hr. used at a demand higher than a certain base, in order to bill a customer on a certain contract, L. H. Kistler told of using a graphic watt meter and calculating by planimeters the kw.-hr. used. This method involved considerable clerical labor and was none too accurate. Later a Swiss excess meter was installed, he said, and on the whole proved satisfactory. The operation of the meter was explained. In discussion other methods of metering such a contract were brought out, one of which was to use a relay to energize a second watt-hour meter when the base load was reached. All methods appeared to have disadvantages.

L. D. Snow summarized a survey conducted by the questionnaire method designed to disclose the practices of Northwest companies in the matter of keeping their rotating standards in calibration. Nearly all companies reporting used some form of "master rotating standard," calibrated against precision-indicating watt meters, by which to check their "working rotating standards," though different methods of effecting periodic checks of their meters were manifest. In discussion, the essence of the problem developed to be the elimination of the human error in such checks, and J. E. Bridges described the Westinghouse photo cell method, while D. W. Proebstel told of using an exciter and m.g. set to hold a given load on the standard while it was being checked against the indicating meter.

A documentation of all the rules covering service and meter loop requirements in different cities and states in the territory, whether such rules were in the form of state or municipal codes or simply company regulations, was presented by R. M. Freeman. Discussion brought out that when such rules were in state and municipal codes rather than in company regulations their enforcement was simpler.

Overhead Systems Committee

T. A. PURTON

Idaho Power Company, Boise, Chairman

Discussing the type of rural line that should be built, how it should be served and where located, what part the engineer should play in estimating costs and securing the business, and the actual manner of constructing rural lines, R. E. Gale told of a survey of the rural distribution situation in the Boise territory in which it was figured that 15 kw. per square mile would have to be provided. An attempt to cheapen construction by the use of 30-ft., untreated poles and other minor economies was considered and later abandoned as uneconomical in the long run. Sixty-nine hundred 11-kv. star primaries were made standard, and it was found necessary to provide a separate position at the substations for rural lines so as to avoid the reciprocal troubles between them and urban

feeders were they to be fed from a single circuit. In a long discussion of costs, practices and various phases of rural distribution, it was indicated that most companies had standardized on 11-kv. Y distribution, and that none thought it possible to cheapen construction to any extent.

R. J. Davidson presented a series of charts designed to represent graphically many of the requirements of the National Electrical Safety Code, as examples of how a quick picture of the code's requirements might be made available for reference. It was concluded that the adoption of the National Electrical Safety Code in Washington would meet with favor.

Prime Movers Committee

C. C. SIMERAL
Portland Electric Power Company, Portland, Chairman

The addition of a 25,000-kva. steam turbo-generator at the Lincoln St. plant of the Northwestern Electric Company, Portland, now under construction, was described by John Hooper from a paper prepared by Tom Perry. Steam at 250-lb. gage, superheated to 550 deg. F., will be used in the new unit, these conditions being largely governed by existing steam conditions in the present plant. Only 2,500 hp. additional boiler capacity is needed, and is to be installed in one unit of the Sterling type, 72 tubes wide and with drums built of 40-ft. sheets. Normal operation calls for burning hog fuel, but auxiliary oil burners will be supplied. The condenser is to be of modern type hanging unsupported on the turbines. Cinder cones instead of cinder washers are being provided.

The effect of pre-drying hog fuel on the over-all boiler efficiency was discussed and two types of dryers were explained by W. A. Struthers. With normal fuel containing 47 per cent water dried to leave only 10 per cent, the over-all efficiency was calculated to be increased from 55.7 to 68.4 per cent. Practically the same increase could be effected by heating the air to 550 deg. F. Some laboratory experiments have been made without reaching many definite conclusions. Discussion indicated that further studies were needed to determine the amount of heat to be applied over a given period of time so as to get the best results without driving off any of the more volatile inflammable gases.

A cost record of the application of water-cooled grates to hog burning boilers as against the ordinary grates revealed that the water-cooled grates would have to last four years to warrant the additional expense involved, according to J. E. Yates, whose experiments in this field have not been completed.

Underground Systems Committee

C. H. HOGE
Puget Sound Power & Light Company, Seattle, Chairman

A description of the ring feeder system for a.c. underground distribution with four-wire, three-phase secondary network protected by fuses was presented by F. L. Rohrbach. F. E. Fisher described the radial fed system in use in his company in which 240-120-volt, three-wire secondaries, with the neutral point grounded, are fed from single-phase transformer banks. Special reference was made in this paper to the use of translators by which three adjacent secondary lighting phases are connected to provide a delta connection for the distribution of 240-volt, three-phase power from the single-phase lighting banks.

The history of developments in a.c. underground distribution, with a comparison of the loop-feeder system with fuse protection on the secondaries and the radial-feeder system using protectors instead of fuses, was traced by H. Richter, Westinghouse Electric & Manufacturing Company, East Pittsburgh, in which the merits and distinctive uses of the two systems were brought out. He prophesied a marked tendency toward development in which generators would be tied together through a.c. networks permitting omission of bus-tie reactors and reduction in the size of station circuit breakers, which will make for continuity of service by cheaper and simpler methods than have heretofore been employed.

Discussion brought out relative costs of the two systems described and showed that conditions to be met largely governed the choice of systems and apparatus, while methods of operating were treated at length. The tendency toward higher primary voltages without substations was stressed as the probable solution of caring economically and adequately for the growing load concentrations in urban centers.

Meetings

Coming Events

American Institute of Electrical Engineers—Annual Pacific Coast convention in Santa Monica, Sept. 3-6, 1929.

Association of Electragists, International—Annual convention in Swampscott, Mass., Sept. 30-Oct. 4, 1929.

Camp Co-Operation IX—At Association Island, Henderson Harbor, New York, Aug. 2-6, 1929.

International Association of Electrical Inspectors, Northwest Section (formerly Northwest Association of Electrical Inspectors)—Annual convention in Vancouver, B. C., Sept. 9-11, 1929.

Southwestern Section (formerly California Association of Electrical Inspectors)—Annual convention in Sacramento, Calif., Sept. 18-20, 1929.

National Electric Light Association—Fifty-second annual convention in Atlantic City, N. J., June 3-7, 1929.

National Electrical Manufacturers Association—Spring meeting at The Homestead, Hot Springs, Va., May 20-25, 1929.

National Electrical Wholesalers Association, Pacific Division—Annual convention at Hotel Del Monte, Del Monte, Calif., June 13-15, 1929.

Northwest Association of Electrical Inspectors—Annual convention and exhibition at Vancouver Hotel, Vancouver, B. C., Sept. 9-11, 1929.

Northwest Electric Light and Power Association—Annual convention at Olympic Hotel, Seattle, Wash., June 26-29, 1929.

Oregon Electragists—Meeting in Eugene, Ore., June 10-11, 1929.

Pacific Coast Electrical Association—Annual convention at Hotel Del Monte, Del Monte, Calif., June 19-22, 1929.

Radio Trade Show—In Civic Auditorium, San Francisco, Aug. 17-24, 1929.

Salt Lake Electrical Men Enjoy "Get-Together"

The annual "get-together" of the members of the electrical industry in Salt Lake City and adjacent territory was held April 9 at the Hotel Utah. J. M. Perlewitz, president of the Electrical League of Utah, which sponsored the affair, opened the meeting with a brief address of welcome. Other speakers included Blair Richardson, manager, real estate department, Hogle Investment Company, who spoke on "Real Estate"; Clyde C. Edmonds, general manager, Utah Poultry Producers' Association, who discussed "Utah's Poultry Industry"; and Orval W. Adams, vice-president, Utah State National Bank, whose subject was "Banking."

In the evening dinner was served to about 450 guests, followed by an address on "Engineering in Modern Business" by C. E. Skinner, assistant director of engineering, Westinghouse Electric & Manufacturing Company, East Pittsburgh. P. B. Garrett, Westinghouse Electric & Manufacturing Company, San Francisco, gave a demonstration of Televox. G. M. Gadsby, president and general manager, Utah Power & Light Company, acted as toastmaster.

Edison Appliance Company to Observe Anniversary

IN commemoration of the 25th anniversary of the founding of the Edison Electric Appliance Company's plant at Ontario, Calif, several days of celebration will be held beginning May 17.

On the opening day a barbecue will be held in the afternoon in San Antonio

E. H. RICHARDSON

Park, to which everyone is invited. Saturday, May 18, will be "home-coming day" and all former employees of the Edison company and the original Hotpoint company are invited to participate. On Monday, May 20, the Los Angeles Electric Club will turn over its entire program to the Edison company and an entertainment characterizing 25 years of electrical progress is planned.

Tuesday, May 21, will be open-house at the Ontario plant. In the evening a dinner is to be given in honor of E. H. Richardson, works manager of the plant, who will complete on that date 25 years of service with the Edison Electric Appliance Company and its predecessor companies. Mr. Richardson was a pioneer in the development of electrical heating appliances. It was he who perfected the domestic electric iron and brought it to a stage where it was practical for every-day usage.

NE.W.A. Convention Date Changed—The date of the quarterly meeting of the Pacific Division, National Electrical Wholesalers Association, orginally set for June 6-8, has been postponed to June 13-15. The convention will be held at Hotel Del Monte, Del Monte, Calif., as originally planned.

Seattle Electric Club Plans Golf Tournament—Plans for the annual golf tournament of the Electric Club of Seattle, to be held May 20, are under way. Rena Thatcher, of the Puget Sound Power & Light Company, is chairman of the golf committee.

Eighth Annual Conference at Association Island Announced—Camp Co-Operation IX will be held at Association Island, Henderson Harbor, New York, Aug. 2-6, inclusive, according to announcement of R. Bourke Corcoran, chairman of the League Council.

Contractors, Dealers and Inspectors

Tacoma Adopts Ordinance Which Regulates Appliance Sales

REQUIRING the registry of any appliance sold in the City of Tacoma using 1,000 watts or over, the new ordinance of the city of Tacoma, Wash., takes a step farther in a direction already pioneered by the City of Portland in its ordinance of six years ago. Like Portland, all appliances and fittings sold in the City of Tacoma will be required to be approved, either by the Underwriters' Laboratory, the Bureau of Standards or on special authorization after tests have been made by certain officials in the city itself.

The paragraph relating to the sale of merchandise is contained in Article III, Sec. 301, Par. A-3, dealing with licenses. It reads as follows:

Any person who sells or offers or exposes for sale any electrical device, apparatus or equipment designed for attachment to or installation on any electrical circuit or system, for light or power, shall have an electrical dealer's license for each place of business conducted by such person, provided that such licensee makes a temporary demonstration of such articles elsewhere than at his licensed place of business without being required to have a license for such sales at temporary demonstration. He shall report the sale of any and all appliances over 1,000-watt capacity to the inspector. Such reports shall give the customers' names, addresses and complete data covering apparatus sold.

New sections or additions to old sections of the Portland ordinance include the following:

A section dealing with the time of inspection and notification. A section dealing with permits and permit fees. The entire section dealing with licenses in which above quoted portion concerning electrical dealers is included. It also provides for a license for all persons doing electrical work. An article setting up a board of appeals. A section requiring rigid conduit installations in cases of motion picture theaters, apartment houses and certain other occupancies considered hazardous. A paragraph limiting the use of flexible tubing. Requirements calling for double lock-nut construction. A section dealing with outlet boxes and cabinets, sizes and construction. Tables of wire sizes and diversities (of which more will be noted later). A section dealing with switches. In this latter, switches are required for all lights in bathroom, kitchen, basement, toilet, outside porches, etc. A new section on services and meters. A new section on grounding. Two sections dealing with lighting fixtures and wiring, and construction requirements. A new department dealing with signs and outline lighting, particularly to take care of the new luminous tube illumination practice. Then a final article on occupancies and the types of wiring required for them.

Several other items in the new ordinance are of interest. Among these are the fact that no inspection fees are required except where a second call is made to check up on defective work found in a previous call. A $1 charge is made for this. The dealer's license fee is set at $1 per year. Owners may take out permits to do work on their own premises providing they show themselves capable of making the installation according to the rules.

The tables of diversities below will prove of particular interest:

New Code to Be Printed for 1929

A 1929 code is to be printed. At first it was planned only to print the supplement to the 1928 National Electrical Code but the electrical committee meeting in February and the correlating committee meeting on the subject of grounding, Article IX, brought about the need for a 1929 edition. The approval of the N.F.P.A. at its meeting in May will authorize the new edition.

Among the changes to be made are a return to 1925 grounding rules, pending further investigation of the entire subject of grounding.

Another item of interest to Californians is the fact that the one point at which the minimum range wiring standard adopted last year was at variance with the code, will be eliminated. For runs up to 50 ft. and not over two 90-deg. bends, 1-in. conduit will be authorized to be used for three No. 6 wires. On the recommendations of Western members of the electrical committee, the change was fire adopted for services and range wiring but has now been made to include all short runs.

Wholesalers Return Dinner to Contractors

Inspired by the friendly spirit that prevailed during the banquet given by contractors to the electrical wholesalers of Denver last January, the wholesalers returned the compliment and sponsored a similar meeting for all electrical contractors of the city on March 20. There were 44 contractors and 37 wholesalers present. The meeting was presided over by Clifford G. Knapp, chairman of the electrical wholesalers division of the Electrical League of Colorado.

Following a lively entertainment program, Rev. Wilson P. Ard spoke on "Friendship in Business." James R. Collier and John J. Cooper represented the contractors and wholesalers respectively in their addresses on "Co-operation."

It is believed that these meetings will be succeeded by others of a similar nature during the year. No business matters are discussed, the sole intent

Classification Single and 2-family Dwellings and Apartments	Diversity Factor %	Max. No. Outlets Per Circuit	Min. Watts Per Sq.ft. 1½ Plus
1- 5 circuits	100	10	1,000
6-10 circuits	90	10	
11-15 circuits	80	10	
16-20 circuits	70	10	
21-30 circuits	60	10	
30 and above	50	10	
Hotels—Rooming Section			
0-10,000 sq.ft. per feeder	100		1
Part above 10,000 sq.ft. up to 50,000 sq.ft.	80		1
Part in excess of 50,000 sq.ft.	70		1
Other sections	100		2
Stores	100		2
			Per Lineal Ft.
Display lighted	100	20	50
Show windows	100		200
			Per Sq.ft.
Office Buildings			
0-10,000 sq.ft.	100	6	2
Part above 10,000 sq.ft.	70	6	2
Office building corridors	100	15	1
Industrial, commercial (loft) bldgs.	100	6	1
Garages			
Open floor space only	100	6	½
Shop, office and store	100	6	2
Hospitals			
0-25,000 sq.ft.	100	10	¾
Space over 25,000 sq.ft. (except X-Ray and operating room)	60	10	¾
Schools			
0-10,000 sq.ft.	100		1½
Space over 10,000 sq.ft.	50		1½
Storage Warehouses			
0-50,000 sq.ft.	100	10	
Part over 50,000 sq.ft.	50		

Other Kinds of Buildings and Occupancies—Factories, theaters, churches and other places of public assemblage, ballrooms, dance halls, restaurants, club and lodge rooms, community centers, armories, libraries, operating suites and X-Ray departments in hospitals, etc., and buildings for special purposes such as banks, motion picture studios, etc., vary so widely due to geographical location, individual requirements, architectural and ornamental treatment, that no standard could be established upon which the watts per square foot could be determined with accuracy. Therefore, the feeders for these and other buildings for which the watts per square foot are not listed above, must be determined by the specific load which they are to serve. This applies also to special uses, such as floor and outline lighting, signs, etc.

In the case of theaters, minor theaters and motion picture houses, services may be calculated for a load less than the total connected load in accordance with a demand factor which shall be approved in advance and in writing in each individual case by the electrical division.

In the case of range installations the per cent of total connected load which may be used in determining the size of feeders is given in the following table:

Number of Ranges	Demand Factor %
1 to 3	100
4 to 9	70
10 to 12	60
13 to 20	50
Over 20	35

Cooking devices of more than 1,320 watts shall be supplied by conductors whose diversity shall be the sum of nameplate ratings, as follows:

For the first two per feeder—diversity none.

Between 3 and 10 per feeder, for the excess above 2, a diversity of 50 per cent.

Where the number exceeds 10, for the excess above the second, a diversity of 40 per cent.

The diversity factors set forth in paragraphs (d) and (f) of this section are based upon average load conditions and may be safely used for all installations which have been adequately designed; however, if at any time after the equipment is put in service it shall be found that conductors are of insufficient capacity to carry the maximum demand without overfusing, they shall be increased to comply with the requirements for overload protection applying thereto.

being to promote good fellowship and harmony between the two branches of the industry.

N.F.P.A. Field Engineer Visits Coast

VICTOR H. TOUSLEY, electrical field engineer for the National Fire Protection Association, has been a recent visitor to cities in the eleven Western states on behalf of the association.

Mr. Tousley is also secretary and Angeles, San Francisco, Portland, Seattle, Spokane, Helena, Mont., and other cities in the West. In each case he talked over inspection and fire-prevention problems with local inspection authorities.

In Los Angeles a special meeting was called at the office of R. H. Manahan, chief of the department of electricity, at which about 45 inspectors from surrounding towns were present. Mr. Tousley also spoke before a meeting under the auspices of the contractors' association at the Chamber of Commerce Building, Los Angeles.

Victor H. Tousley, on his first trip West, finally found an Indian (papoose) when he passed through Albuquerque.

Mr. Tousley is also secretary and treasurer of the International Association of Electrical Inspectors.

For the past 25 years he has been identified with the electrical department of the City of Chicago and has been chief of that department until recently. He promises to return to the Pacific Coast in September to attend the conventions of the Northwest Division and Southwest Division of the International Association of Electrical Inspectors. With him will come a number of other notable leaders in inspection and code matters.

Southern Electragists to Invade Mexico in Sea Attack

REBEL forces having failed to make any impression on the Mexican State of Baja California, the California Electragists, Southern Division, have taken unto themselves a contract to see what they can do about it. The steamship "Emma Alexander" has been chartered by the Southern Division as convoy for the expected 300 who plan to take the town of Ensenada, Mexico, by storm on May 18.

Memories of previous boat-ride excursions in connection with the annual spring convention have revived the desire for this type of outing this year. All arrangements have been completed to make the event one of noteworthy importance.

The train from the Pacific Electric depot at Sixth and Main Sts. leaves Los Angeles at 5 o'clock Friday evening, May 17. The steamship "Emma Alexander" leaves the dock at Wilmington at 6 p.m. It is planned that all business meetings can be held aboard the ship before arrival at Ensenada, in order that all conventioneers may go ashore for a good time and take in the sights.

The first meeting, a general meeting for contractors and representatives of all other branches of the industry, will be held Friday night after dinner between 7:30 and 9:30 p.m. After that there is to be two hours of dancing and other entertainment.

The only other business meeting will be between 9:30 a.m. and 12 noon, Saturday, when a closed meeting for contractors is to be held. At this time there will be a report of association activities and plans for the remainder of the year will be discussed. Officers for the ensuing year also will be elected.

As meeting time is limited, everything is being planned to move quickly and smoothly. All programmed speakers' talks are to be brief and succinct.

Very reasonable rates have been arranged for, including meals, berths, entertainment, registration fee, etc. These range from $17.50 per person to $25 per person, according to the class of accommodations desired.

The boat is expected to arrive at Ensenada at 1 p.m. Saturday and to remain there until 10 p.m. that night. The return to Los Angeles is expected to be made by 3 p.m. Sunday afternoon. It is being urged that wives of contractors and their friends be invited to make the trip. Reservations are limited to 300 and cards have been mailed to all those who might be interested. Reservations are available, however, at the Electragists' Southern Division headquarters, 610 Cotton Exchange Building, Los Angeles, or at the Northern Division headquarters, 522 Call Bldg., San Francisco.

All the thrills of a sea voyage await the delegates. From left to up, at the rail, crossing the bar, are Frank Connolly, who seems worried about the menu; Art Rowley, who has got far beyond such details; Frank McGinley, always nonchalant because he smokes political cigars; Bob Wilson, in a rush as usual, hurrying for an appointment at the rail; and Jack Farley, hooked up in parallel to the deck. Estimable Hyde has taken to water and the secretaries Helen Mikesell and Lois Hoadley, believing in "save the women and children first," are going to row home.

Personals

Advanced to Vice-President of Idaho Power Company

A MAN of university training backed by thoroughly practical experience is M. L. Hibbard, recently named vice-president and general manager of the Idaho Power Company. He succeeds W. R. Putnam, who resigned to become associated with the Electric Bond & Share Company in New York.

Mr. Hibbard previously had been assistant general manager of the Idaho

M. L. HIBBARD

Power Company, and his career includes such diverse activities as constructing the street railway system for San Antonio, Texas, doing research work in the General Electric laboratories at Pittsfield, Mass., and acting as chief operating engineer for the Northern States Power Company.

Mr. Hibbard was born in Farnham, in the province of Quebec, Canada, in 1883, and as a young man attended McGill University, Montreal, graduating from there in 1906 with the degree of B.Sc. Immediately after graduation he did a year's research work at the General Electric laboratories, and in the next three years served variously with the Montreal Street Railways, as a freelance consulting engineer, and with the Union Light, Heat and Power Company of Fargo, N. D.

In 1910 he had charge of engineering and construction of the gas, electric and street railway systems of San Antonio. From 1911 to 1923 he was general manager of the Union Light, Heat and Power Company of Fargo, and the Fargo and Moorhead Street Railway. With the merging of these companies with the Northern States Power Company of Minneapolis in 1923, he was named assistant vice-president of the latter company, and in 1926 was made chief operating engineer. He severed his connection in 1928 and joined the Idaho Power Company. Mr. Hibbard is also vice-president of the Northwest Electric Light and Power Association.

H. T. Burnam, since July, 1925, assistant to the general superintendent of light and power, El Paso Electric Company, El Paso, Texas, has been made agricultural engineer in the company's sales department. In connection with his sales activity, Mr. Burnam will specialize upon the development of new uses for electric service on the farm. He has been connected with the El Paso company since 1921. **Lee A. Smith**, of the engineering department, has been named to succeed Mr. Burnam as assistant to the general superintendent of light and power.

Roy J. Heffner, general supervisor of employment and training, Pacific Telephone and Telegraph Company, San Francisco, has been made assistant educational director of the Bell Telephone Laboratories with headquarters in New York. In his new duties he will have charge of the employment, training and progress of college men in the Bell Telephone laboratories. He will also be in charge of the laboratories' relations with educational institutions. Mr. Heffner is a former director of the San Francisco Electrical Development League.

F. H. Winkley, manager of the sales lighting section, General Electric Company, Schenectady, paid a visit to the Pacific Coast in April, spending some time in Los Angeles, San Francisco and cities of the Northwest. Mr. Winkley expressed pleasure at renewing old friendships in San Francisco where, five or six years ago, he spent about six months as chief lighting specialist. Another member of the General Electric Company's staff who has been visiting the Pacific Coast recently is **E. G. Newton**, in charge of the primary cut-out section, with headquarters in Pittsfield, Mass.

C. A. Heinze, formerly assistant electrical engineer of the Los Angeles Bureau of Power and Light, has been appointed assistant chief engineer and general manager of the Department of Water and Power, following the recent reorganization, upon recommendation of **H. A. Van Norman**, chief engineer and general manager of the department. Mr. Heinze is president of the Los Angeles Electric Club.

Deane Miller, formerly division sales manager of the Boise division, Idaho Power Company, has resigned to accept a position with the Frank Edwards Company, Salt Lake City. He is succeeded by **J. F. Cooper** as sales manager, and **E. G. Adams** has taken over Mr. Cooper's duties as division chief clerk. **S. E. Dodson** has been made assistant chief clerk, succeeding Mr. Adams.

H. W. Mosier, superintendent, The Southern Sierras Power Company, Barstow, Calif., has been elected director of the local Chamber of Commerce.

Stanley W. Guthrie, assistant general counsel of the Los Angeles Gas and Electric Corporation, has resigned to practice law on his own account.

Portland Utility Appoints New Assistant Manager

CHARLES M. SANFORD has been appointed assistant general manager of the Pacific Power & Light Company, Portland, succeeding George C. Sawyer, who resigned recently to join

CHARLES M. SANFORD

the Electric Bond & Share Company in New York.

Mr. Sanford has been with the Pacific Power & Light Company since January, 1927. His entry into the electrical industry, however, was made in 1902 when he became division superintendent's clerk with the Jersey City, Hoboken & Patterson Street Railway Company, now part of the Public Service Company of New Jersey. He later became assistant storekeeper in the line department, but shortly left this company to work for the Delaware & Hudson Company in the coal fields of Pennsylvania, where he remained two years, ending as storekeeper at Wilkesbarre, Pa.

In June, 1906, Mr. Sanford came West, settling in Seattle where he spent a year with the Seattle Electric Company, and a year with the Hanford Irrigation and Power Company, which then was building the Priest Rapids power plant and high-tension line, the Coyote Rapids pumping station, and the Hanford Canal system in eastern Washington. In 1908 he was transferred to Hanford, Wash., to manage these properties. When the company went into the hands of a receiver in 1913 he was retained by the receiver as manager, and in 1915 when the purchasers at the receiver's sale formed the Agathon Land Company, the Black Rock Irrigation and Power Company and the Consumers' Ditch Company, Mr. Sanford was made general manager of all those companies. In January, 1927, the Pacific Power & Light Company brought him to Portland to handle its tax department, gradually enlarging his responsibilities until, on Mr. Sawyer's regislation, he was made assistant general manager.

Victor W. Hartley, executive secretary, California Electrical Bureau, San Francisco, recently spent some time in Salt Lake City conferring with the Red Seal committee of the Electrical League of Utah.

Lighting Expert Awarded Coffin Medal

FOR HIS work in educating the public and the trade in the principles of and needs for better lighting Clark Baker, of the National Lamp Works of the General Electric Company, Oakland,

CLARK BAKER

Calif., has been awarded a medal and purse under the Charles A. Coffin Foundation of the General Electric Company.

The presentation was made at an official dinner held at the Athens Athletic Club, Oakland, March 27, and attended by all executives and a large number of employees of the General Electric Company in the San Francisco Bay area. The Hon. C. A. Eaton, personnel director of the General Electric Company and personal advisor to Girard Swope, made the presentation.

The citation read in part: "This certificate of merit to Clark Baker is tendered in recognition of his unusual originality, organizing ability and perseverance in campaigning the story of light to the electrical industry and the public on the Pacific Coast through numerous educational programs."

Mr. Baker's activity, which earned him this honor, has been conducted largely through educational committees organized by him and inspired by his own particular enthusiasm for improved lighting and eye conservation and has extended from the Northwest to southern California and as far East as Utah. He started his educational activities with the lighting committee of the Commercial Section, P.C.E.A., of which he was chairman for several years, then carried the same program into the Northwest Electric Light & Power Association in succeeding years. He organized lighting schools to acquaint people in the electrical industry with the fundamentals of lighting. To all of his work he has brought a dramatic quality. His early experience on the stage and in connection with theater lighting has enabled him to dramatize his educational lectures to an unusual degree.

The Charles A. Coffin Foundation was established by the late Mr. Coffin for General Electric Company employees. Its purpose is to encourage signal contributions by employees of that company "for the increase of its efficiency and progress in the electrical art." During the five years since it was established only 37 awards have been made, or an average of seven a year, to the company's 75,000 employees. Mr. Baker is the first to receive the award on the Pacific Coast, at least for educational and promotional work.

Lewis A. Lewis, since Dec. 1, 1919, sales manager of The Washington Water Power Company, Spokane, has been appointed assistant general manager in charge of sales, according to announcement of D. L. Huntington, president. In his new position Mr. Lewis will be in charge of sales not only in Spokane but throughout the territory served by the company in ten counties of eastern Washington and six counties of northern Idaho. Mr. Lewis is a graduate of Washington State College in electrical engineering and has been in the employ of The Washington Water Power Company since 1908.

Walter G. Blossom, superintendent of education, Southern California Edison Company, has been selected by R. H. Ballard, president of the company, to act upon occasion in the capacity of company chaplain. Mr. Blossom's advice and counsel will be available to employees in times of distress, particularly when death occurs in a family.

J. F. Pollard, manager, Coast Valleys Division, Pacific Gas and Electric Company, Salinas, and chairman, Commercial Section, P.C.E.A., returned early in April from a trip to the East. After attending the meeting of the Commercial National Section in Chicago, Mr. Pollard went on to New York and Washington, D. C.

C. D. Weiss, superintendent of stores and transportation, San Diego Consolidated Gas & Electric Company, was elected chairman, and W. E. Frazier, also of the transportation department, was elected secretary of the Transportation Section of the Pacific Coast Electrical Association at its recent meeting held at Riverside.

Joseph T. Farrer, a prominent business man of Provo, Utah, was elected a member of the board of directors of the Utah Power & Light Company at a meeting of the board held in Salt Lake City, March 1. Mr. Farrer succeeds Col. C. E. Loose, deceased.

Andrew G. Gordon, Puget Sound Power & Light Company, Seattle, has been named editor of the Puget Sound Electrical Journal, succeeding the late A. E. Batwell.

William Weston, who recently joined the staff of the J. G. Pomeroy Company, has been made manager of its San Francisco branch. Mr. Weston formerly was connected with The Electric Corporation.

G. A. Campbell, manager, Truckee River Power Company, Reno, Nev., paid a visit to San Francisco the latter part of April.

On L. A. Water & Power Department Staff

WITH the recent reorganization of the Los Angeles Department of Water and Power and the appointment of H. A. Van Norman as chief engineer and general manager in charge of the entire department, J. Hunter Clark became executive assistant under Mr. Van Norman.

Mr. Clark joined the Department of Water and Power in 1916 just prior to his graduation from the University of Southern California. He soon attracted the attention of Carl A. Heinze, now assistant general manager, who made him chief clerk in the distribution division. This was followed by his promotion to assistant to Mr. Heinze. Later Mr. Clark rose to the position of execu-

J. HUNTER CLARK

tive assistant to E. F. Scattergood, chief electrical engineer of the Department of Water and Power. When the department reorganization was effected, the details of which were announced in the April 1 issue of Electrical West, Mr. Van Norman selected Mr. Clark to be one of his chief aides in the unified organization.

Obituary

Joseph Staples, deputy city electrician of Denver, died suddenly in that city during the past month.

B. E. Lucas, for many years sales manager, Stubbs Electric Company, Portland, died on April 6 from complications brought on by a disease from which he had suffered for some time.

W. S. Sultan, until about three years ago manager of the Globe Light & Power Company, Globe, Ariz., died in Bisbee April 10. Mr. Sultan recently had been living in Los Angeles.

Thomas Francis Quigly, superintendent of the Yuma Utilities Company, died in Yuma, Ariz., on April 18. At the time of his death Mr. Quigly was in charge of the Colorado River substation of The Southern Sierras Power Company, of which the Yuma Utilities Company is a subsidiary.

Manufacturer & Distributor

Listenwalter & Gough Buy Baker-Joslyn Interests

Arrangements were completed on April 1 for the purchase by Listenwalter & Gough, Inc., distributors of electrical construction materials in California, of the jobbing business of the Baker-Joslyn Company, of San Francisco. The addition to their line of the products formerly handled by the Baker-Joslyn Company gives Listenwalter & Gough, Inc., an opportunity

G. S. Hoyt, former manager of the Baker-Joslyn Company, shakes hands with Philip S. Gough in front of the San Francisco office that Listenwalter & Gough have taken over with the purchase of the Baker-Joslyn interests.

to offer their customers a more complete service in electrical supplies.

C. G. A. Baker, president of the Baker-Joslyn Company, has retired from the electrical jobbing business after 20 years of continuous activity in that field. Philip G. Gough, president of the purchasing concern, announces that under the new management the former policies of the Baker-Joslyn Company will continue in effect with respect to that company's relations with its clients.

Industrial Controller Co. Merged With Square D

A merger of general interest to the electrical industry is that recently announced uniting the Square D Company of Detroit Mich., and Peru, Ind., and the Iudustrial Controller Company of Milwaukee, Wis. The two companies will in future be conducted under one management and will be known as the Square D Company.

The operations of the new Square D Company will be carried on through three divisions. The switch and panelboard division, at Detroit, will manufacture safety switches, meter service switches, duct, panelboards for both lighting and power, fuse cabinets, and voltage testers. The porcelain division, at Peru, will manufacture porcelain insulators and other porcelain products. The Industrial Controller division will manufacture compensators, speed regulators, motor circuit switches, automatic starters, field rheostats, magnetic contactors, pressure switches and float switches.

T. J. Kauffman, president of the old Square D Company, continues as president and operating head of the new company. A. A. Schueler, for several years sales manager of the Square D Company, becomes general sales manager of the new organization. F. W. Magin, who was general manager of the Industrial Controller Company, will continue as general manager of the Industrial Controller division of the new Square D Company, in addition to becoming vice-president of the company. H. L. Van Valkenburg will be chief engineer of the Industrial Controller division of the new Square D Company, continuing in the same position he held with the Industrial Controller Company.

New San Francisco Firm to Represent Manufacturers

An organization recently formed in San Francisco to represent manufacturers of electrical equipment is the **Marshall-Eddy Company,** with offices at 50 Hawthorne St. The organization consists of Harry E. Marshall, who for the past nine years has represented in San Francisco the Mueller Electric Company, of Cleveland, manufacturer of Universal test clips, and E. D. Eddy. For the past ten years Mr. Eddy has been president of Eddy & Clark, advertising agents of Akron, Ohio, but prior to that time was a manufacturers' agent in San Francisco.

The Marshall-Eddy Company has been appointed Pacific Coast representative of the Iler Electrical Manufacturing Company, of Cleveland, makers of potentiometers, condulets, and Iler live-line testing apparatus.

Curtis Lighting of New York Moves—The general offices and show rooms of **Curtis Lighting of New York, Inc.,** illuminating engineers and sales organization for X-Ray reflectors and lighting equipment, have been moved from 31 West Forty-sixth St. to the twelfth floor of the New York Central Building, 230 Park Ave., New York.

California Representative for Water Heaters—H. Layton Pfeiffer has been appointed factory representative in California for the Clark Electric Water Heater Division of the McGraw Electric Company, Omaha, Neb. Mr. Pfeiffer's headquarters are at 581 Magellan Ave., San Francisco.

Changes Made in Crawford Range Sales Set-Up

Changes of personnel have recently been announced involving the sales organizations on the Pacific Coast for Crawford ranges, manufactured by the Walker & Pratt Manufacturing Company, Boston, Mass.

H. H. Russell, formerly in charge of the Seattle territory for Walker & Pratt, has been placed in charge of all sales of Crawford ranges on the Pacific Coast. His headquarters now are at the San Francisco office of the Graybar Electric Company, distributor of Crawford ranges in the San Francisco territory.

J. L. White, formerly merchandise manager of the Portland Electric Power Company, has been appointed to succeed Mr. Russell in Seattle and will have charge of the territory served by the Puget Sound Power & Light Company. F. D. Barrett, who formerly handled the Portland territory, now has charge of sales in the remainder of the Northwest. L. J. Garner, formerly merchandise manager of the central district, Puget Sound Power & Light Company, Seattle, has joined the Crawford organization and will assist Mr. Russell in handling the California territory.

Burton Y. Gibson, formerly in charge of sales in the California territory, with headquarters in San Francisco, recently resigned from the organization after an association of eight years.

To Represent Thomas A. Edison, Inc., in the West—Announcement has been made by **Thomas A. Edison, Inc.,** Orange, N. J., that arrangements have been made with the following firms to distribute its products in the West: Hendrie & Bolthoff Manufacturing and Supply Company, Denver; Inter-Mountain Electric Company, Salt Lake City; Baker-Hamilton & Pacific Company, San Francisco; Holley Mason Hardware Company, Spokane; Reiman Wholesale Electrical Supply Company, Los Angeles; and Seattle Hardware Company, Seattle.

Appoints Representatives in Western States—Roller - Smith Company, 233 Broadway, New York, manufacturers of electric measuring instruments, relays and circuit breakers, has appointed J. C. McDougall its district sales agent for the states of Washington, Oregon and Alaska, with headquarters in the Alaska Building, Seattle. Jackson Brown, Jr., 701 Kittridge Building, Denver, has been appointed to represent the Roller-Smith Company in the states of Colorado, Utah, Wyoming and New Mexico.

Lighting Fixture Company Moves—The **Seattle Lighting Fixture Company** has moved from its former location at 617 Fourth Ave., Seattle, to a four-story building at 222 Second Ave.

Westinghouse Plans Lighting Institute in New York

For the purpose of depicting the application of electric light to all phases of life, commerce and industry, the Westinghouse Electric & Manufacturing Company will open a permanent lighting institute at the Grand Central Palace in New York City during the latter part of May. The institute will be open to the general public and free to all visitors. Scientists, engineers, architects and designers may present their plans for any undertaking and receive advice from the institute on lighting installations.

Occupying the space of an entire city block, the institute will represent in "Mazda Avenue" a typical city street. On it will face buildings of every kind from a modern home to an industrial plant, offering opportunity for studying lighting for every conceivable interior. In a transportation room model lighting will be shown for steam and electric railway cars and buses. The lighting of airports also will be featured.

The opening of the institute will be coincident with the opening of the convention of the National Electric Light Association in Atlantic City and the inauguration of Light's Golden Jubilee.

Additions to Personnel of Fort Wayne Company on Pacific Coast—George E. Frey, formerly district manager, Wagner Electric Corporation, Portland, has been appointed district representative in western Oregon and Washington for the **Fort Wayne Engineering & Manufacturing Company.** Ivan L. Swift, formerly district manager of the Gresham office of the Portland Electric Power Company, has been appointed district representative for eastern Oregon and eastern Washington and the State of Idaho. E. O. Arnold, Pacific Coast manager of the Fort Wayne company, with headquarters in Portland, recently spent some time in San Francisco conferring with L. A. Rothe, California representative, on plans of the company for expansion in that territory.

Pacific Coast Firm Opens Assembling Plant at Gary, Ind.—Announcement has been made by the **Pacific Electric Manufacturing Corporation,** of San Franfisco, of the opening on April 1 of an Eastern branch assembling plant and warehouse at Gary, Ind. The Gary plant has been placed in charge of E. S. Kessler, former executive engineer at the San Francisco home office.

To Represent Manufacturer of Exerciser—The Tilden-Kienly Company, 545 Sutter St., San Francisco, has been appointed Pacific Coast representative of the **Devices Corporation,** Cambridge, Mass. The Devices Corporation manufactures the University exerciser and reducer.

To Represent Line Material Company in California—The Associated Wholesale Electric Company, Twelfth and Los Angeles Sts., Los Angeles, distributor in the State of California for the Line Material Company, South Milwaukee, Wis., has opened an office and warehouse in Oakland, Calif., at 1687 Atlantic St., where a complete stock of Line Material Company products is carried. F. A. Lavigne, formerly with the Westinghouse company, has been made manager of the San Francisco territory, and M. H. Annett is in charge of the Oakland office and warehouse. William F. Brainard, formerly manager of the Western Light & Fixture Company, Los Angeles, has joined the sales force of the Associated Wholesale Electric Company in that city.

Capital Putting!

Three enthusiasts who couldn't wait to get to the golf links gave a sidewalk demonstration at the last Electragists' convention in Sacramento. Left to right, they are: D. G. Kendall, Diamond Electrical Manufacturing Company, San Francisco; Sam Russell, president, H. B. Squires Company; and Ralph Dabadie, of the Oakland office of the Diamond Electrical Manufacturing Company.

Pacific Coast Representatives Appointed for Automatic Switch Company—The **Garland - Affolter Engineering Corporation,** with offices in Los Angeles, San Francisco and Seattle, has been appointed exclusive Pacific Coast representative of the Automatic Switch Company, New York, manufacturers of solenoid magnet valves, automatic transfer switches and other electric controlling devices.

New President of Johns-Manville Corporation Named—Lewis H. Brown, former secretary of the **Johns-Manville Corporation,** New York, has been elected president to fill the post left vacant by the recent death of Theodore F. Merseles.

New Territorial Representatives for Burndy Engineering Company—Representatives of the **Burndy Engineering Company, Inc.,** New York, recently appointed on the Pacific Coast to have charge of the company's business in their respective territories, are: Denver—Joy & Cox, Inc., 314 Tramway Building; Seattle—Fred W. Carlson, 424 Dexter-Horton Building; and Los Angeles—L. W. Thompson, 912 East Third St. Mr. Thompson will handle his territory under the direction of the H. M. Thomas Company, which represents the Burndy Engineering Company in San Francisco.

Joins Cutler-Hammer Staff—Walter F. Price has become associated with the San Francisco office of **Cutler-Hammer, Inc.,** Milwaukee, Wis. He will have charge of the sales of Cutler-Hammer wiring devices and the Trumbull-Vanderpoel Manufacturing Company's safety switch line which has been acquired by Cutler-Hammer. Mr. Price was at one time executive secretary of the California Electragists and prior to that was electrical equipment expert for the California Electrical Co-operative Campaign, now the California Electrical Bureau. He was the originator of the electrical home exhibits in California.

New Electro-Kold Distributor Appointed — Davis-Kaser Company, of Walla Walla, Wash., has been appointed by the Electro-Kold Corporation, Spokane, as its distributor in the south central Washington territory. C. A. Harvey has been placed in charge of the new electric refrigerator department of the Davis-Kaser Company.

Enlarges Los Angeles Headquarters—Otto Demmert, of **The Demmert Company,** has enlarged his head quarters at 106 Third St., Los Angeles. The company represents the I-T-E Circuit Breaker Company, Bowie Switch Company, Sundh Electric Company, Jenkins Manufacturing Company, and others.

Cunningham Electric Company Changes Name—Cascade Machinery & Electric Company, Inc., is the new name of the Cunningham Electric Company, 2726 First Ave., South, Seattle. There has been no change in the personnel of the company.

San Francisco Firm in New Location—Announcement has been made by **The Frink Corporation,** San Francisco, that it has moved to new quarters in the Building and Machinery Exhibit Building, 557 Market St.

General Electric Opens Display Rooms in Seattle—Display rooms for distribution and retail sales of General Electric refrigerators have been opened in Seattle at 1925 Fifth Ave.

New Equipment

New Electric Ranges

A new line of electric ranges has been added to its list of STAR-Rite electrical appliances by **The Fitzgerald Manufacturing Company,** Torrington, Conn. The ranges are finished in gray porcelain enamel with white enamel trim and may be obtained in either the complete automatic type having both time and temperature control, or in what the manufacturer terms the semi-automatic type, having temperature control only, including oven thermometer. The model illustrated is the larger cabinet type. An apartment type with three cooking units above and oven below comes in two styles—with heat indicator on oven, or semi-automatic with temperature control.—Electrical West, May 1, 1929.

Light-Duty Drill

A light-duty, ¼-in. electric drill designed for the use of automotive shops, electricians, plumbers, carpenters and mechanics is announced by the **Van Dorn Electric Tool Company,** Cleveland. The manufacturer describes it as the ideal drill for the tool kit. Being light and compact, it is not intended for continuous production drilling, but as a strong serviceable tool for intermittent work. Retail price, $25.—Electrical West, May 1, 1929.

"Adjustomatic" Iron

The "Adjustomatic," a new iron recently introduced by the **Westinghouse Electric & Manufacturing Company,** Mansfield, Ohio, has a finger throttle directly beneath the handle by means of which the user may adjust the temperature of the iron to any heat desired. Once set by turning the lever over a graduated scale, the temperature control requires no more attention. The iron has a rosewood handle, brown Bakelite plug, and rubber and asbestos insulated cord. The list price is $8.75. —Electrical West, May 1, 1929.

Medium Priced Washer

This new washer, a Maytag product designed to sell at a moderate price, has just been placed on the market by **The Frederick Company,** 100 West Monroe Building, Chicago. Quietness of action and freedom from vibration were two of the principal aims of the manufacturer in producing the "Silent Frederick." The motor is mounted in a felt saddle and all points of contact with the machine are felt-cushioned. The wringer is of the safety-feed type, self-adjusting, with seven positions. Nickel-plate lines the copper tub. Dealerships for this machine are available to all retail stores.—Electrical West, May 1, 1929.

Electrically Heated Atomizer

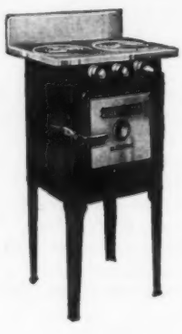
Acting on the knowledge that heat makes a nasal spray much more effective and soothing, the **Beardsley & Wolcott Manufacturing Company,** Waterbury, Conn., has manufactured the new Torrid electrically heated atomizer.

This atomizer heats to just the right temperature any semi-solid or liquid preparation for use in the nasal passages and bathes them with a heavy vapor, according to the maker. The atomizer may be used also for prepara-

tions which do not require heating. The device has a DeVilbiss nebulizer with all metal parts of brass, heavily nickel-plated, and blue rubber bulb, cord and base. The nichrome heating element consumes five watts. Intended retail price $3.50.—Electrical West, May 1, 1929.

Convenience Outlet Range

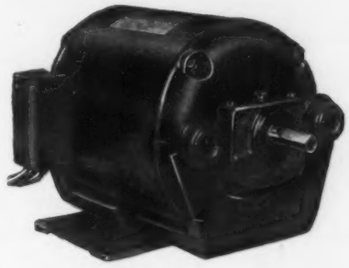
A new popular-priced Universal electric range that operates from a convenience outlet has been announced by **Landers, Frary & Clark,** New Britain, Conn. Although requiring no more floor space than an ordinary chair, this portable range has ample cooking capacity for the average-sized family. The oven of the convenience outlet range is constructed like the standard-size Uni-



versal range ovens, with capacity for an 8-lb. roast, four loaves of bread or any similar quantity of food. It has a temperature indicator and is sufficiently well insulated to make possible the cooking of food on stored heat. The list price is $59.50.—Electrical West, May 1, 1929.

Rubber-Mounted Motor for Refrigerators

A new type of rubber-mounted motor known as the 57RA, designed especially for use in electric refrigerators, has been developed by the **Wagner Electric Corporation**, St. Louis, Mo. The motor proper is completely insulated from the supporting cradle-shaped base by means of rubber bushings, making its action very quiet, but at the same time the entire outfit is practically rigid and shaft alignment is in no way endangered. Other important alterations in the motor itself have been affected making for greater quietness and improved



electrical performance. In addition to equipping governor weights with rubber bumpers, as was done previously, the rooker arm has been redesigned so as practically to eliminate brush noise during starting and stopping. This motor is of the brush-lifting type, the brushes being lifted off the commutator as soon as the rotor attains operating speed—Electrical West, May 1, 1929.

Outlet Box

An outlet box, No. 1288X, with reversible clamp and bushing plate for side or bottom knockouts and suitable for use with metallic cable, non-metallic

sheathed cable or loom, was announced recently by the **Jefferson Electric Company** (formerly Chicago-Jefferson Fuse & Electric Company), 1500 South Laflin St., Chicago.

A feature of this box is the type of clamp which is reversible, permitting the cable to be brought in from either the bottom or side knockouts. It is provided with bushed holes and eliminates the necessity for a bushed flanged plate or brass ferrule. Its holes being completely closed, the box conforms to underwriters' specifications. — Electrical West, May 1, 1929.

Recent Publications

Seamless Connectors for Splicing Wire and Cable—Burndy Engineering Co., Inc., New York, has issued a folder descriptive of Anaconda seamless connectors. Photographic illustrations show the various operations involved in inserting a cable into a connector. Portable draw benches and the necessary equipment for installing Anaconda seamless connectors in the field are also described and price lists of draw benches, connectors and dies are given.

Network Transformers and Accessories — An eleven-page, illustrated booklet, Circular No. 1,807, describing network transformers and accessories for secondary network systems, has recently been released by the **Westinghouse Electric & Manufacturing Company**, East Pittsburgh.

New Hotpoint Catalog—Edison Electric Appliance Co., Inc., Chicago, has issued a new illustrated catalog showing the complete line of Hotpoint ranges, water heaters, air heaters and hotplates for 1929. All four- and six-unit ranges are shown with the "thrift-cooker" added and wattages on former 1,800-watt units have been increased to 2,000 watts. Copies of the catalog together with price lists may be obtained from any district office of the company.

Hotpoint Electric Servants—Dealer's Catalog No. Y500 for 1929 showing the complete line of Hotpoint convenience-outlet appliances with price lists effective March 1 has been issued by the **Edison Electric Appliance Company, Inc.,** Chicago. Several new appliances added to the line since the last edition are included.

Sign Lighting Equipment—Bulletin No. 47, recently published by the **Reynolds Electric Company**, Chicago, describes the Reco line of flashers for electric signs and displays, color lighting equipment, traffic controls for stop and go signals, timers for special contracting work, motor-driven dimmers, 1/20- to ¼-hp. d.c. and a.c. motors, and reflectors for poster and bulletin boards.

Reduction Gears for Marine Engines —The history, past and present, of reduction gears for marine engines is told in a four-page leaflet entitled "A Triumph of Mechanical Engineering" published by the **Westinghouse Electric & Manufacturing Company**, East Pittsburgh. The leaflet describes the Melville-Macalpine gears manufactured by the company.

Lightning Protection—Two new publications of the **Westinghouse Electric & Manufacturing Company**, East Pittsburgh, are devoted to lightning arresters. "Effective Lightning Protection" is the title of a 20-page circular giving information on the nature and magnitude of transient voltages on electrical systems, lightning arrester requirements and applications. Information also is given on oscillograph studies of lightning phenomena and the economic value of lightning protection. Leaflet No. 20149-E describes the Type SV autovalve lightning arrester designed for station use on alternating current light and power circuits from 1,000 to 220,000 volts.

Twisted Service Cable—A new illustrated booklet on twisted service cable has been issued by **The Okonite Company**, Passaic, N.J. The booklet contains complete descriptions of house-service and street-lamp connections and there is a special section on specifications with a detailed table of heights and sizes.

Outdoor Lighting — **The Artistic Lighting Equipment Association** has prepared for general distribution an attractive booklet illustrated in color on "Exterior Lighting and the Use of Lanterns." The booklet may be had upon request of the association at 420 Lexington Ave., New York.

"The Lighting of Modern Office Buildings"—This is the title of Booklet No. 500 published by the architectural department of the **Holophane Company, Inc.,** New York. The company's complete line of office lighting equipment is described and photographic illustrations show typical installations.

"Restful Ironing"—This is the title of an attractive illustrated booklet that has been published by the **Savage Arms Corporation**, New York. Elsie Heminway is the author and she tells the story of the benefits that the electric ironer brings to the woman who does the ironing in the home.

Disconnecting Switches — Leaflet 20370, recently released by the **Westinghouse Electric & Manufacturing Company**, East Pittsburgh, describes Type H indoor disconnecting switches of the single-pole, single and double-throw, and selector types.

"Jointing and Miscellaneous Materials"—This is the title of a new illustrated, 46-page catalog, No. 741, published by the **Standard Underground Cable Company**, Pittsburgh, describing the Standard cable accessories.

ELECTRICAL WEST Barometer of Industrial Activity in Western States

Reports received on the consumption of electrical energy by the manufacturing plants of the Western states indicate that the first quarter of the year witnessed the highest average rate of activity ever recorded by the manufacturing plants of this section. The average rate of operations for the past quarter was 19.7 per cent over the same period last year.

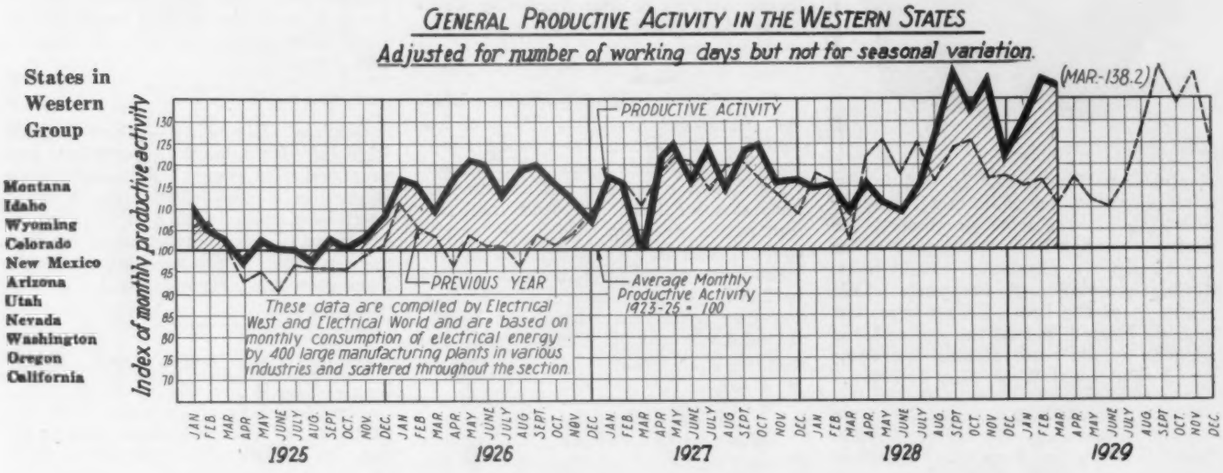
Operations in this territory during March continued on a high plane. March activities were 1.7 per cent under February, slightly less than the normal seasonal decrease recorded in past years. As compared with March of last year, however, the current rate of activity showed an increase of 25 per cent. In the Western states, March normally witnesses the lowest rate of activity for the year, hence there is every reason to believe that the coming months will witness an increased rate of activity, notwithstanding the high rate of operations prevalent since the opening of the current year.

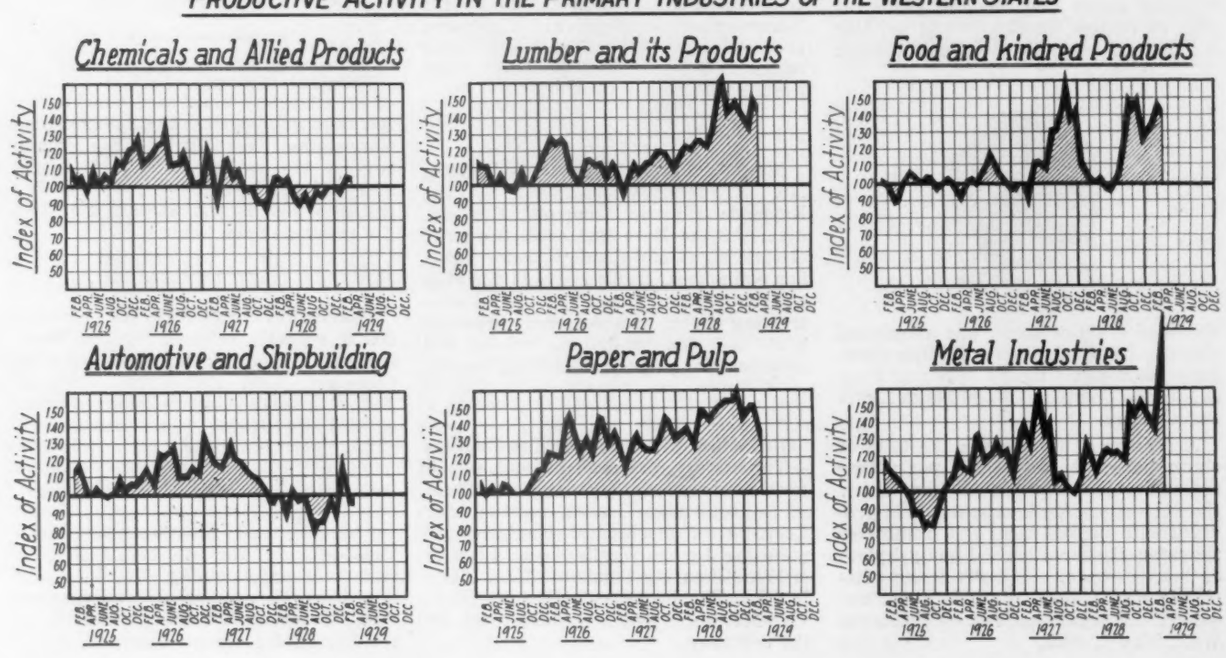
All of the industrial groups in the Western states, with the exception of the metals group, and the stone, clay and glass group, reported a drop in activity during March as compared with February, but the stone, clay and glass group is the only industrial group in the section reporting a rate of activity during March under that of March, 1928.

Indexes of Industrial Activity in the Western States

(All figures adjusted for number of working days.)

	Mar. 1929	Feb. 1929	Mar. 1928	Av. 1st 3 Mo. 1929	Av. 1st 3 Mo. 1928
All industry	138.2	140.8	110.4	136.9	114.0
Chemicals and allied products	104.6	106.9	85.8	104.7	109.5
Food and kindred products	142.6	149.3	101.8	143.4	106.8
Forest products	147.2	153.0	122.0	146.2	121.8
Metals group	206.8	167.6	113.3	172.0	123.4
Paper and pulp	135.4	152.3	131.2	146.5	135.7
Rubber and its products	200.7	209.0	153.6	200.6	151.2
Shipbuilding	94.1	94.2	84.7	103.3	93.8
Stone, clay and glass	131.3	129.2	139.4	133.6	153.5




PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE WESTERN STATES
Chemicals and Allied Products
Lumber and its Products
Food and kindred Products
Automotive and Shipbuilding
Paper and Pulp
Metal Industries
Index of Activity